THE AEROPLANE

Incorporating
Aeronautical Engineering
Edited by - - THURSTAN JAMES

Founder and First Editor
(1911-1939), C. G. GREY

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HELIPORTS FOR LONDON

LAST Sunday was sufficiently clement, in the South of England at any rate, for many motorists to decide to take their Sunday lunch away from home. Among these peregrinators were the editor of THE AEROPLANE and his family. In the course of their venturing seawards they found themselves involved in the tremendous diversion made necessary by the enlargement of Gatwick airport. They wondered how many of those on the road with them knew that the dumpy circular building, now cut off from the airfield altogether by the new road, was the original airport administrative centre and control tower. However, whether knowledgeable about aviation or not every traveller on the highway between Reigate and Crawley must get lost in admiration at the drive and enterprise of all those who have decided to agree that the new airport at Gatwick will be fit and ready for a royal opening on June 9.

However, it is not our purpose here to express doubts about the readiness of Gatwick for the great occasion on June 9; what did strike us with considerable forcefulness was the scale of the effort needed to convert not only what was formerly a satisfactory airfield but one in correspondingly level country to the requirements of the new jet civil transports. The enormous scale of the effort strikes one with all the more impact should one have been examining recently the landing strips, hewn out of the Malayan jungle, that are being used by such slow-landing aircraft as the Prestwick Pioneers.

Sooner or later somebody has got to say "stop" to the demand by aircraft designers for ever longer reaches of concrete. The economics of the aerodrome business do not bear looking into, and yet are satisfactory neither to those who have found the money to put the concrete down nor to the operators who have to pay fees to use it. Sir Gerard d'Erlanger disclosed in the course of the past week that B.O.A.C. pay £3 million a year in fees to aerodrome operators. Yet the aerodrome operators are still dissatisfied and will be until fees rise.

No wonder in such circumstances that the very modest requirements of the helicopter are regarded with favour by many municipalities. They feel that the small plots of ground or roof area needed should not be hard to provide. Indeed they reserve most of their wonder for B.E.A., which seems to them to be so long agetting helicopters into service.

Yet it is true that the fact there are still no multi-engined helicopters of adequate seating capacity within some years of airline operation is a matter that worries the airline owners much more than it does the airport operators. Indeed there is at this moment a delegation of airlines touring the United States to see what can be done to get a multi-engined 80-seater helicopter into airline service with the shortest possible delay. The same delegation is to tour Europe and is expected in this country around the end of the month.

What one might call an evangelical attitude towards the helicopter has never been conspicuous in the Ministry of Transport and Civil Aviation. And at this stage of affairs strenuous crusading is necessary. The demands of housing and commerce are such it has not been possible, even with the benevolent attitude adopted by M.T.C.A., to preserve a helicopter landing site anywhere near the centre of London. However, it has now been disclosed that two alternative sites are being considered in parallel by the L.C.C. at the request of the Minister of Housing and Local Government. And both as a result of private ventures.

Rotorports Ltd., which concern was formed early in 1957 (managing director, Capt. John Crewdson) has announced that it has made application for Town Planning Consent to the London County Council and Ministry of Housing and Local Government to the provision of a large landing area on pontoons permanently moored in the River Thames within a few minutes of the West End and City, somewhere near the South Bank site, we understand.

Earlier it had been announced that Westland Aircraft Ltd. are seeking approval for immediate construction of a heliport. This would consist of a landing platform built over the river with a parking area adjacent on the river bank. It has been disclosed that this site would be near Belmont Works, York Road, Battersea.

Which of these two arrangements will be the most satisfactory must remain for the engineers concerned to work out. As the intention behind both schemes is to provide facilities for civil operators other than the promoters of the schemes, ease of turn-round, provision for maintenance and refuelling will have to be considered. No doubt it is after investigating such matters that Westlands have made their proposal for a stage built out over the water with a parking space adjacent on the land.

Whatever the decision, we welcome the enterprise shown by two private concerns towards forcing what is still regarded as the most important capital in the World to make provision for the only form of aircraft yet available that can convey people from city centre to city centre.

MATTERS OF MOMENT

Research for the Supersonic Airliner

TWICE last week leading members of the aircraft industry raised the vital matter of the supersonic airliner. In the course of his presidential address to the Royal Aeronautical Society George Edwards declared: "I am certainly convinced that nothing will stop the ultimate operation of long-range supersonic civil aeroplanes. I believe that the operating costs when the time comes will be within reasonable distance of the operating costs—as we know them—of the supersonic jets. . . ."

Sir Roy Dobson also raised the subject when talking to members of the Avro 504 club (see p. 333).

What we now await to hear is some firm pronouncement from the Government that the importance of the British aircraft industry having a supersonic airliner to export has been recognized and that in consequence steps have been taken to establish a planning body to organize the necessary research over the next 10 years. Let us make no mistake about it! Unless some specific body with the necessary authority is appointed to carry this job through, the research vital to the successful development of a British supersonic airliner will not get done.

As our defence budgets shrink, more and more of our research effort will be devoted to guided missile work. Already the proportion is such as seriously to handicap our work on manned aircraft. We must plan and authorize research work on the supersonic airliner *now*.

Presidential Occasion

A LARGE and distinguished audience did full justice to the Royal Aeronautical Society's fifth Presidential Address—given by Sir George Edwards at Church House, Westminster, on February 26. Indeed, the imposing assembly hall was almost filled to capacity and those fortunate enough to be present heard a most entertaining and instructive dissertation on the development of speed in transport from the 17th century to the present day.

The president was introduced by LORD HIVES, who paid tribute to his work for British aviation. Hundreds of Sir George's Viscounts had been sold, he said, and all had been bought by willing customers. No pressure had been brought to bear; these aircraft had been sold throughout the World on their merits alone.

SIR GEORGE EDWARDS began by speaking of the difficulty he had had in selecting a suitable subject on which to speak. And with typical humour he remarked: "I felt that the dignity of my Office precluded a 45-minute sustained shouting match directed at the Government."

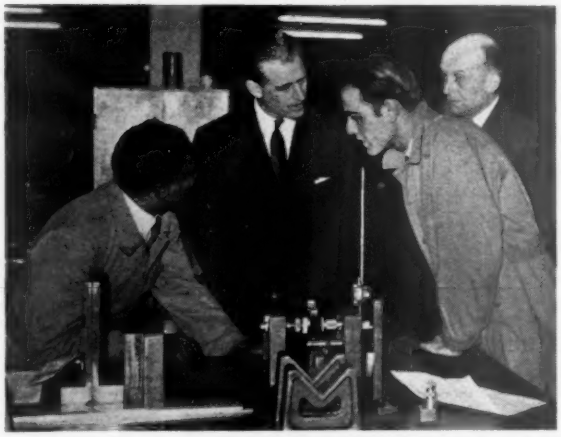
More seriously, he went on to discuss the present position of the R.Ae.S. Membership had been increasing steadily and for the first time it exceeded 10,000; in addition there were 6,000 branch members. The Society's new Guided Flight Section was very active and had "infused into the old body some vigorous and worthwhile new blood which looks like making it hop and jump about in a most undignified and not very guided, but extremely healthy, fashion."

News of the greatest interest was that the Society is looking into the possibility of building a lecture hall at its Hamilton Place headquarters. This might, said the president, come about as a result of the proposed changes at Hyde Park Corner.

Sir George went on to survey the influence of speed on transport and to show the inevitability of supersonic air travel. This part of his address is summarized on pages 318 and 319.

After Sir George had spoken, the Shell Film "High-Speed Flight—Part 2—Transonic Flight" was shown for the first time. In it no expense has been spared to explain, as simply as possible, the aerodynamics of transonic flight. Many excellent animated diagrams are used. The film is in colour and includes a series of fine air-to-air shots of high-speed aircraft. This film seems certain to be as great a success as its predecessor in the series, "Approaching the Speed of Sound."

The vote of thanks to Sir George was moved by DR. G. W. H. GARDNER, chairman of the R.Ae.S. Guided Flight Section. Dr. Gardner endorsed Sir George's remarks on the keenness of



ROYAL INTEREST.—The Chelsea College of Aeronautical and Automobile Engineering was visited by H.R.H. The Duke of Edinburgh on February 27. Here the Royal visitor talks to two students from the Commonwealth; in the background is Mr. J. A. C. Williams, the new Principal of the College.

AIRBORNE.—Engine tests are now being done with the Ryan Vertiplane; in this new picture the machine is, in fact, hovering clear of the ground.

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this new section. He spoke of the President's qualities both as a man and as an effective ambassador for British aviation.

MR. J. R. COWNIE, the graduate member of the R.Ae.S. Council, seconded the vote of thanks. He spoke of the encouraging way that the Society's membership had increased regardless of ups and downs in the aeronautical world and mentioned the confidence of its younger members in the future; the Society had more graduates and students than ever before.

After the ceremony at Church House the members and their ladies were received at the Society's home, at 4 Hamilton Place, by Sir George and Lady Edwards. The building was packed, but the organization was excellent—buffets on every floor provided an ample supply of refreshments. And the guests clearly much enjoyed a notable aeronautical occasion.

Dectra Flight Trials

A NUMBER of tentative conclusions from the evaluation trials by an A. and A.E.E., Boscombe Down, Valiant on the ranging and tracking facilities of Decca Dectra were given in a lecture before the British Institution of Radio Engineers on February 26. Presented by Mr. C. Powell, head of the survey and special projects department of The Decca Navigator Co., Ltd., and Mr. D. A. Hendley, chief design engineer on the Dectra project, the paper "Dectra: a long-range radio-navigational aid" gave a general description of the system which has been outlined in previous issues of THE AEROPLANE.

Phase One of the trials—to test in the air the tracking pattern radiated from Newfoundland—was completed last summer before the ranging station in the U.K. came into operation. Eight sorties, totalling 39½ hours, were flown at heights between 35,000 and 50,000 ft. and ground speeds of 350 to 550 knots. Two aerials were installed for use with Dectra, one an elliptical disc of 280 sq. in. in the belly of the Valiant, and the other an 80-sq.-ft. metallic-foil inner skin to the radar nose.

Allowing for cyclical and pattern-phasing errors caused by too long a time constant in the discriminator which has since been eliminated, and a change in the phasing angle at the Slave station, the random errors in tracking had a standard deviation of 2 n.m. up to 1,500 n.m. range. These tests also showed that the equipment was suitable for pilot operation and the Flight Log a convenient method of data display.

Of the ranging trials, little can be said with certainty since only four of the 13 flights involved have so far been analysed, and these not fully. For those four runs, within the zone between 10° and 50° West, there appears to be, compared with the datum, a residual uncertainty of approximately ±2 Dectra lanes, or ±2½ n.m., in the ranging co-ordinate readings.

Tenth Anniversary Air Races

REGULATIONS for the 1958 National Air Races, which are to be held (with the help of the Kemsley Flying Trust) at Coventry Civic Airport, Baginton, from July 10 to 12, have just been issued by the R.Ae.C. As the first National Air Races were organized in 1949 this year marks their 10th anniversary.

As in the past, the races this year will take the form of handicap class events. There will be three rounds to each race, all of which will be flown over a number of laps of a closed-circuit course of about 11 miles. Points will be awarded for results on handicap, the winner of each class race being the pilot who scores the highest aggregate points for the three rounds—so the first over the line is not necessarily the winner. The points system will also be used to decide the British Air Racing Champion of the year.

This year the number of aircraft which may be entered for each round has been increased from 10 to 14. The classes are:—

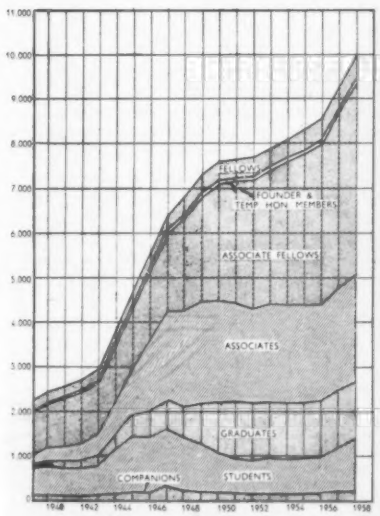
The Kemsley Trophy (four laps—for the fastest aircraft); the Osram Cup (three laps), and the Goodyear Trophy (three laps). Prize money in each round will be first, £100; second, £50; and third, £25. For the highest speed achieved in each class during the three rounds the Air League Challenge Cup, the Norton-Griffiths Challenge Trophy and the Grosvenor Challenge Cup will be awarded respectively.

British pilots flying British aircraft who finish in the first seven places in each of the three races will compete in the King's Cup Air Race, which is to be flown over four laps of a 20-25-mile course on July 12, on which day there will be the usual flying display.

In the King's Cup Air Race no prize money is awarded. The winner will receive only the cup; and the S.B.A.C. Cup will be awarded for highest speed. There is likewise no prize money for the Championship, only the trophy.

The entry fee is £5 per round (£15 per race), and the list closes on June 9.

Also at the Baginton meeting will be the annual competition for the British Lockheed International Aerobatic Challenge Trophy. A maximum of 100 points will be awarded to contestants by a panel of judges for scope, accuracy, originality, and artistry and planning. Prize money is: First, £250; second, £200; third, £150; fourth, £100; fifth, £50, and sixth, £25, and additional prizes of £25 each will be awarded to all pilots who compete. The eliminating trials will be on July 10, the final on July 12. The entry fee is £10; the list closes June 9.

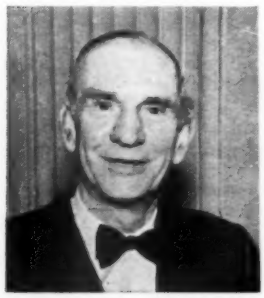


Above, growth of the R.Ae.S. Right, above, speakers at the Presidential Address: Dr. G. W. H. Gardner, Lord Hives and Mr. J. R. Cownie. Right, Lord and Lady Knollys at the Reception and Sir George and Lady Edwards greeting Air Vice-Marshal Sir Arthur and Lady McDonald.

Photographs copyright "The Aeroplane"

James Norman Retires

AFTER 21 years' service with the Air Registration Board Mr. James Norman retired on February 28, having held the position of chief surveyor since 1937.



James Norman has had a very long association with the aircraft industry, particularly on the civil side. As long ago as 1916 he joined the Aircraft Manufacturing Co., which had been formed to build Geoffrey de Havilland's designs, and was employed as the flight head of the experimental department. He remained with A.M.C. (or "Airco," as it was popularly known) until 1920, when he took a position with George Holt Thomas' Aircraft Transport and Travel, Ltd., the first British airline which operated from Croydon.

He obtained his first ground engineer's licence in March, 1920. With the closing down of A.T. and T. at the end of 1920, Norman transferred to The de Havilland Aircraft Co., Ltd., then at Stag Lane. He became the company's general ground engineer, joining the inspection department in 1923. When de Havilland set about producing the Gipsy aero-engine to power his light aeroplanes Norman was brought into association with its development, and later became chief inspector of the Engine Department. Until 1928 he was in this position, and then joined the British Corporation Register of Shipping and Aircraft—probably making him the first aircraft surveyor.

Within 12 months the Corporation was authorized to recommend renewals of C.s of A. for privately owned and club aircraft and, through his position, Norman became the first person outside the Air Ministry to act in this capacity.

He remained as senior surveyor of the Corporation until the amalgamation in 1933 of the two shipping registers—which became known as the Joint Aviation Advisory Committee of the British Corporation Register and Lloyd's Register—and continued in a similar capacity until he joined the A.R.B. on its formation in 1937.

James Norman has thus had a most impressive record of service in civil aviation. For this service he received the M.B.E. in 1950.

Should Aircraft Engineers be Licensed?

LAST WEEK'S newspapers, in general, gave a somewhat sensational twist to the statement of policy issued by the Society of Licensed Aircraft Engineers—the recommendations of which were summarized in last week's issue on page 275.

Whether or not the airline operators and others agreed with the conclusions, the report was admirably put together and the arguments were propounded with skill and conviction. The two or three picked paragraphs (in which suggestions were made that the increased use of unlicensed engineers might be a danger to air transport) formed only a tiny fraction of a 10,000-word document and were designed to support rather than to make a case.

Briefly, the Society's general council believes that the skill, general knowledge and ethical standards of aircraft engineers can only be maintained at a continued and guaranteed high level if some licensing system—preferably in a revised form—is used as a measure of personal efficiency and as a means of qualification for promotion. Not one single word in that sentence is likely to have been used in the report—but that is how the tenor of the arguments appears to an onlooker.

The report also points to the lack of homogeneity in the other national rulings on the matter and to the outdatedness of the present British system—and offers a revised system which has been worked out in some considerable detail.

Undeniably (if one may offer an over-simplified child's guide) the British system is no more than the developed variant of one designed to be satisfactory in the days when one properly qualified engineer could be expected to overhaul and to sign out a complete airliner—engines and all.

The "A" and "B" licences permit (with qualifications) an engineer to sign out an aircraft and its engines, respectively, after maintenance or repairs, and the "B" and "C" licences permit the signing out of aircraft and engines after overhaul and/or modifications and replacements. Which was very fine when the engineers concerned were dealing with a Rapide or Dragon. A more recent modification of the system demands that the engineer signing out a helicopter airframe must also be in possession of the appropriate engine licence. Which is not unreasonable; a present-day helicopter is, after all, not much more than a kind of levitating engine-room.

In addition to those involving the aeroplane itself, there are a series of mysteriously designated "X" licences. These first came into use when aircraft began to show a few complicated and specialist "extras" in their make-up. I am not sure, but I think that the original licence in this category was given to those engineers who were clever enough to be able to show that they could swing a compass.

Nowadays there are half a dozen of these "X" licences—and there might well be a dozen more if all specialist maintenance engineers had to be effectively qualified by licence. The present half-dozen consists of those relating to compasses, ignition systems, propellers, instruments, electrics and autopilots.

These "X" licences at present cover both overhaul and maintenance. The S.L.A.E., incidentally, considers that the electrics and instrument "X" licence categories should have separate maintenance and overhaul parts, that a new electronics category should be introduced and that all the ancillary categories should, in fact, be redesignated. The onlooker might consider this to be a fairly modest demand; most of us would be hard pressed in passing written examinations on the principles of the thermionic valve or our old-fashioned friend the boost capsule.

As for international licensing systems—there are, effectively, none. ICAO has Type I and Type II licence categories—equivalent, respectively, to the U.K. "B" and "D" and "A" and "C" categories—and the qualifications involved are given in Annex 1 (Personnel Licensing) on the Convention. But, as the Society's report explains, this international body has, in effect, given up the uneven struggle in the face of non-compliance and has agreed that any personnel licensing system is "interchangeable" with an approved national inspection organization (*vide* paragraph 4.2.4 of the ICAO Annex 1).

The other international body, IATA, considers that complex individual licensing systems are undesirable (i.e., difficult) and that the responsibility for personnel selection and training, and for overall airworthiness, should be left with the individual airlines.

This acceptance of airline responsibility has, broadly, been the case during the past few years. The bigger airlines have specialized workshops and have their own approved inspection organizations and training systems. Aeroplanes are, nowadays, very complicated devices and specialization is necessary. No engineer can know the Britannia as he knew the D.H.86 some 25 years ago. "Type" licences for the Boeing 707 and its powerplants would not mean very much to an engineer when he came to the job of overhauling it.

Nevertheless, most of us will agree with the S.L.A.E. report in its general demand—that there should be standards of ability, overall knowledge and engineering ethics, and that these standards can best be assessed and maintained by some form of examination and licensing system. Even a failed examinee is a better man for having tried, and the work done for an examination provides a background of general knowledge which can make the difference between a "mechanic" and an "engineer."—H.A.T.

News of Aircraft, Engines and Missiles

EP. 9 EVALUATION.—Two Edgar Percival EP. 9s have been procured by the Army Air Corps for evaluation, and after handling trials at Boscombe Down, will go to the AAC Centre at Middle Wallop. The EP. 9 is the only fixed-wing general-purpose aircraft available in Britain within the Army Air Corps weight limit of 4,000 lb., and will be assessed for its suitability for the liaison rôle, which may include casualty evacuation and the carriage of tactical stores. It should prove very adaptable for this type of work.

BRISTOL IN S.A.—A new company known as the Bristol Aeroplane Co. (SA) (Proprietary), Ltd., has been formed in Johannesburg as a subsidiary of the Bristol Aeroplane Co. to co-ordinate sales, service and other activities of the Bristol Group. The chairman of the new subsidiary is Mr. C. F. Uwins, who is a deputy chairman of the parent company, and Mr. Noel Holman has been appointed managing director resident in Johannesburg.

NEW HILLER.—Now being test-flown in the U.S.A. is this ultra-light research helicopter developed from the Hiller H-32.

(Levy-Shipp photograph)

MEDITERRANEE POWER.—Type R7 Farandole turbojets, rated at 1,400 kg., are to power the Dassault Méditerranée executive aircraft, a picture of which is on page 329. This engine is directly derived from the Armstrong Siddeley Viper, for which Dassault holds the licence.

ATAR TESTS.—Flight testing of the S.N.E.C.M.A. Atar 9 turbojet is now being made with the engine installed in a special nacelle under the wing root of a Sud-Est Armagnac. The tests are made up to heights of about 41,000 ft. and at a "utilization speed" which reaches approximately Mach 0.6.

TWIN PIONEERS.—The A.R.B. has now lifted the precautionary restrictions imposed on the Twin Pioneer after the accident in Libya in January. A comprehensive test programme will be completed in June, when a safe life for the aircraft will, it is expected, be stated. The three Twin Pioneers for the Persian Flying Club have now been delivered and negotiations with the Spanish operator T.A.E. have been reopened. A Twin Pioneer is due for delivery to the Red Lion and Sun Organisation in May.

U.K. MISSILE FOR U.S.?—Mr. Neil McElroy, American Secretary of Defence, has said that the U.S. might buy a British solid-fuel missile if it were developed before a similar American one. Future rocket weapons, he said, would use solid and not liquid fuel. Liquid-fuel missiles such as Jupiter and Thor were regarded as interim weapons.

IMPROVED FUJI.—The LM-2 light aeroplane is being developed from the earlier LM-1 Nikko. It has a 340-b.h.p. Lycoming engine and seats four.

NA.39 PROGRESS.—People in the villages surrounding Brough aerodrome have been warned by Blackburn and General Aircraft that during the next few weeks the company will be testing new jet engines and that there may be more noise than usual from the works. This would seem to suggest that the prototype NA.39 now has its Gyron Juniors installed and is about to do engine runs.

SWEDISH PRODUCTION.—The first production Saab-35A Draken (J 35A) supersonic single-seat fighter, powered by a Swedish-built Rolls-Royce Avon turbojet, flew at Linköping on February 15, piloted by K. E. Fernberg. Increased thrust results from an afterburner designed jointly by the Royal Swedish Air Board and Svenska Flygmotor. New versions of the Draken are to be the J 35B, with fire-control equipment for collision-course tactics, and the J 35C two-seat trainer. The Draken can carry 12 new 13.5 cm. air-to-ground rockets.

EAST GERMAN PROJECT.—Expected to fly soon, the BB 152 four-jet transport is a product of the East German aircraft industry at Dresden, designed by Dipl. Ing. Prof. Baade (a former Junkers engineer). The engines are said to be of the 014 type rated at 3,150 kg. (approx. 7,000 lb.) thrust each. Gross weight is about 102,000 lb. and the BB 152 will carry 48-72 passengers over ranges up to 1,850 miles. Maximum speed is 560 m.p.h. Sweep-back on the wings is 35° and the engines (now being shown at the Leipzig Fair) are in podded pairs.

EXPORTS START WELL

THE British aircraft industry's exports in January amounted to £11,089,584, according to the S.B.A.C. — the largest January total ever achieved. Aircraft and parts accounted for £6,726,855; aero-engines, £3,942,854; electrical appliances, £246,041; tyres, £46,339; and aeronautical instruments, £127,495.

The best customer was India (£1,568,242), then Iraq (£1,137,363), Lebanon (£653,176), Canada (£463,367) and New Zealand (£423,096).

CODE NAMES.—NATO code names for the new quartet of Soviet turbine transports have now been allocated as follows: Tu-114, Cleet; Tu-110, Cooker, An-10, Cat and Il-18, Coot.

NEW AT READING.—The Handley Page Dart Herald was rolled out at Woodley aerodrome on March 3 preparatory to its engine-run tests.

Photograph copyright "The Aeroplane"

GEOGRAPHICAL RESEARCH.—Three Hurel-Dubois HD.34s seen here awaiting delivery to the Institut Géographique National. One of these aircraft is now being used experimentally in Africa.

CONVAIR PROGRESS.—Tooling for the Convair 880 is close to completion, and major assembly is expected to begin on April 10. Production sequence starts with the wings, to which are added upper and lower fuselage centre-sections, followed by front and rear fuselage.

SNARK ABILITY.—Northrop Snark long-range turbojet missiles have made more than 50 test flights from the Cape Canaveral test centre, Fla. Three successive flights were of 5,000 miles. The Snark is the first operational intercontinental missile of the U.S.; it has made more test flights than the Thor, Jupiter and Atlas ballistic missiles combined. Cruising at 660 m.p.h., Snark can fly 6,300 miles at a height of 60,000 ft. Flying at sea level to escape radar detection a Snark can cover about 2,000 miles.

HEAVY TAKE-OFF.—A Lockheed C-130 Hercules recently took off from the frozen Red Lake, Minn., at a loaded weight of 124,000 lb.—13,000 lb. more than the previous "record" set by the same aircraft in March, 1957. The Hercules was fitted with 20-ft. "Uplift" skis and took off in 700 yd. Using eight JATO units in another test the Hercules took off in 480 yd.

THOR'S NEW NOSE.—Reports from America state that in a recent firing of a Thor IRBM at Cape Canaveral the missile was fitted with a new type of nose cone. This was said to be flattened and designed to overcome the re-entry problems.

ELECTRA HOURS.—Since it first flew on December 6 the first Lockheed Electra has completed more than 100 hours flying; it has flown at 478 m.p.h. and above 30,000 ft. The second Electra flew for 4 hours 20 minutes in two flights on February 13 and in its first week of operations flew about 25 hours.

FRENCH STOL.—The Breguet 940, with blown wing, is scheduled to be ready for flight-testing in April. The prototype is to be used as a flying test bench and powered by four Turboméca Turmo turboprops.

MARBORE PRODUCTION.—Production of the 1,000th Turboméca Marboré turbojet was recently completed at Bordes (Basses-Pyr); the 1,000th engine of this type built under licence by the American Continental company was to be completed by the end of February. The present rate of production at the French factory is 30 a month.

Commercial Aviation Affairs

ROYAL RETURN.—Her Majesty The Queen Mother was to leave Adelaide yesterday, March 6, at the start of her journey back to Britain. She is flying in a Qantas Super Constellation, and after a brief visit to Kalgoorlie, will leave Perth on March 7. The route is then via Mauritius, East Africa and Malta to London.

COVENTRY CUSTOMS.—Mr. Airey Neave, joint parliamentary secretary at the M.T.C.A. has agreed to receive a delegation from Coventry to discuss the provision of Customs facilities at Baginton. The deputation, led by Mr. M. Edelman, a Coventry M.P., was to see Mr. Neave today (March 7).

ANSETT-BUTLER LINK.—Mr. Reginald Ansett has been appointed chairman of Butler Air Transport, following an Equity Court ruling on the validity of proxy votes. These were challenged at the annual general meeting of Butler Air Transport.

EAGLE HERONS.—Four Series 1 Herons, with spares, including engines, have been purchased by Eagle Aircraft Services from an operator in South America. After overhaul they are to be offered for sale.

SLICK SUSPENSION.—Slick Airways has announced suspension of its nation-wide regular air-freight service, with immediate effect, because of continuing losses. Military charter business and service and supply activities at San Antonio will be continued.

DEUX PONTS TOUR.—Between January 16 and February 19, the Breguet Deux Ponts completed 128 hr. 30 min. flying on its tour of North and South America, during which it stopped at Paris, Boston, New York, Washington, Miami, Havana, Bogota, Lima, Santiago, Rio, Natal, Dakar, Algiers and returned to Paris. In addition to its passengers it carried two Simca cars on the lower deck, and more than 3,000 lb. of spares, of which only 2 lb. were used. It crossed the Andes at 15,000 ft., and was back within 6 sec. of its scheduled time in Algiers.

S.A.A. ORDER 707s.—The South African Minister of Transport has announced that South African Airways will order three Boeing 707-320s for use on its routes to Europe.

STARLINER RE-SALE.—The four L-1649A Starliners originally ordered by the Italian L.A.I. have now been sold by Lockheed to T.W.A. The total T.W.A. fleet of L-1649As is now 29.

VERTOL CERTIFICATE.—The Vertol 44 tandem-rotor helicopter was last month granted a C.A.A. Type Certificate. The new approval was necessary because of the many changes over the Vertol 42, certificated last April. First commercial user of the Vertol 44 will be New York Airways, beginning this spring.

PEKING TERMINAL.—On the point of completion near Peking is a modern air terminal claimed to be the largest in Asia. Capable of handling 150 aircraft a day, it has been designed to accommodate the largest types of (Russian) turboprop and turbojet airliners.

LUFTHANSA PLANS.—*Aviation Daily* reports that Lufthansa is considering purchase of six-ten medium-range jets, the choice being between Boeing 720, Convair 880 and de Havilland Comet. Lufthansa already has four Boeing 707s on order.

SCHIPHOL CHANGES.—As forecast in THE AEROPLANE of June 21, 1957 (pp. 871-872), a new company has been set up to run Schiphol Airport. The capital is shared between the Netherlands Government and the municipalities of Amsterdam and Rotterdam. Previously the airport was an Amsterdam municipality undertaking.

AUSTRALIAN AIRPORTS.—The Australian Civil Aviation Department is planning development of five airports capable of handling modern jet transports. The plan includes possible construction of a new airport at Melbourne, and major expansion at Perth. At Sydney, Darwin and Brisbane, measures will have to be taken to reduce noise, heat and blast. Qantas have announced their own £A6 million expansion scheme at Mascot Airport, Sydney, in preparation for introduction of the Boeing 707s in May, 1959.

SABENA PLANS.—In a communication to the Belgian Government seeking permission to double its capital, Sabena has said that it proposes to purchase six-eight Caravelles and not less than 12 Friendships.

S.A.S. ANNIVERSARY.—In one year of operations over the Polar route from Copenhagen to Tokyo, S.A.S. completed 226 flights, and carried about 7,000 passengers and more than 250,000 kg. of freight. Average passenger load on each DC-7C flight was 31.

N.Y.A. PROGRESS.—During 1957 New York Airways improved considerably on the previous year's traffic figures. The results are as follows (with the 1956 figures in brackets): passengers, 68,120 (43,034); freight, 699,496 lb. (608,040 lb.); mail, 2,548,804 lb. (1,156,168 lb.); scheduled miles flown, 464,076 (433,680).

LYDDA EXPANSION.—A new runway is to be constructed at Lydda Airport at a cost of £1.6 million to cope with expanding traffic and the demands of new aircraft. A new terminal building will also be put up.

T.W.A. RECORD.—Since starting international operations in February, 1946, T.W.A. have flown more than 1,676,000 passengers across the Atlantic on 33,000 flights.

Military Aviation Affairs

MISSILE DETAILS.—Further information on the establishment of Thor IRBM bases in the United Kingdom (THE AEROPLANE, February 28) was given by the Minister of Defence last week. The bases will be on active or disused R.A.F. airfields and are to be manned and operated by American-trained crews from Bomber Command. The nuclear warheads will remain in American custody and the missiles will not be launched except by joint positive decision by both Governments. Most, if not all, of the bases will be in East Anglia, Lincolnshire and Yorkshire; none will be established in Scotland.

FRENCH AIR FORCE CUTS.—The radical effects of the French defence budgets, to permit the financing of the Algerian war, on the French Air Force were given last week by M. Christiaens, Vice-Minister of Air. Although research expenditure has been slightly increased, the strength of the Service has been limited to 127,000 and maintenance has been cut by 30%. Only five milliard fr. (about £5 million) have been allowed for fuel, and flying in Metropolitan France will have to be strictly limited.

FORMOSA AIR BASE.—The U.S.A.F. is building a new £9 million air base in central Formosa, which, when completed next year, will have a 4,400-yd. runway. This will give the Strategic Air Command its first major base on the island and will put its bombers within 1,200 miles of Peking and 3,000 miles of Moscow.

News About People

B.G.A. TEAM.—The British Gliding Association announces that the following four pilots will represent Great Britain in the World Gliding Championships to be held at Leszno, Poland, June 15-29: Cdr. N. Goodhart, R.N.; Col. A. Deane-Drummond; Mr. Philip Wills, C.B.E.; and Capt. Anthony Goodhart, R.N. The non-flying team captain will be Mrs. Ann Welch. The pilots will be supported and the team completed by 12 ground-crew members, including Mrs. Deane-Drummond and Mrs. Wills. Also among the team are an aircraft engineer, a meteorologist, a radio expert and a journalist. Both Elliotts of Newbury and Slingsby Sailplanes are building new sailplanes for the contests.

GLIDER DIPLOMA.—Mr. F. N. Slingsby is to receive an F.A.I. Paul Tissandier Diploma in recognition of his work in designing and producing sailplanes and gliders.

MEMORIAL LECTURE.—The 46th Wilbur Wright Memorial Lecture will be given by Mr. G. W. H. Gardner, C.B.E., F.R.Ae.S., at the Institution of Mechanical Engineers, Birdcage Walk, London, S.W.1, at 18.00 hrs. on May 15. His subject will be "Automatic Flight—The British Story."

DUXFORD DIRECTOR. — Newly appointed director of Aero Research, Ltd., of Duxford, is Mr. D. A. Hubbard, who has been with the company since 1939.

FAIREY CHANGES.—Mr. Harold H. J. Chennell, contracts manager of the Fairey Aviation Co., Ltd., since March, 1944, has retired. He had been with the company for 33 years, having joined as assistant accountant in 1924. Fairey's contracts department is now handled by Mr. J. K. Fuller (British Government contracts) and Mr. R. Gearing (commercial and foreign contracts, and the U.K.A.E.A.), and is now responsible to Mr. L. S. Dawkins, secretary and commercial manager.

FAIREY RESIGNATION.—Mr. G. Selwood informs us that he has resigned his position as chief engineer (hydraulics) at the Fairey Aviation Co., Ltd., and has joined Wilmot Breeden, Ltd., of Bridgwater, Somerset, as chief engineer.

L.A.P. LECTURE.—Mr. W. Woodruff, M.T.C.A. ATC Officer in Charge at London Airport, is to deliver a lecture, "Air Traffic Control at London Airport," to the West Middlesex Group of the Institute of Transport on March 11. The meeting will be held in the control tower buildings at the airport at 17.45 hrs. for 18.15 hrs.

DOWTY DIRECTOR.—Mr. L. S. Flatman, C.B.E., A.M.I.Mech.E., has been appointed to the board of Dowty Hydraulic Units, Ltd., of Ashchurch, Glos, as production director.

BOARD APPOINTMENT.—Mr. G. E. Fairbanks, M.I.P.E., a deputy general manager of Elliott Bros. (London), Ltd., has been elected to the board.

NEWMARK VISIT.—The Minister of Supply, Mr. Aubrey Jones, M.P., recently visited the Croydon and New Addington factories and laboratories of the Louis Newmark Group to inspect new micro mechanisms in the field of mechanical and electronical engineering. He talked with administrative and technical representatives, and also with the convener of the Amalgamated Engineering Union.

BLACKBURN CHANGES.—Mr. J. T. Stamper has taken charge of technical development work on the Blackburn NA.39 at Brough, as designer in charge, test aircraft. Mr. A. E. Rowland succeeds him as head of the structures department, and Mr. S. T. Carver is now assistant design office manager.

HIGH-SPEED EXCHANGE.—Sqn. Ldr. J. M. D. Nicholls (right), who is serving on an exchange posting with the first Lockheed F-104A Starfighter squadron in the U.S.A.F., demonstrates the spur attachments for leg restraint in the downward ejection-seat of this Mach 2 fighter. He is undoubtedly experiencing extremes of performance in this aircraft.

TRACKING THE SATELLITES.—"The Jodrell Bank Radiotelescope in Action" will be the title of a lecture on March 12 to the Radar and Electronics Assn. It will be given by Professor A. C. D. Lovell, O.B.E., B.Sc., Ph.D., F.Inst.P., F.R.S., of Manchester University, at University College, Gower Street, London, W.C.1 at 19.30 hrs.

DISTINGUISHED GUESTS AT HALTON.—Among the many present when Sir Dermot Boyle, Chief of the Air Staff, delivered the first Trenchard Memorial Lecture at R.A.F. Halton on February 20, were, left to right, Mr. N. E. Rowe, Lady Edwards, Lord Trenchard, Mrs. Nelson, Sir John Nott-Bower, Katherine Viscountess Trenchard, Lady Patricia Trenchard, Air Cdre. E. D. McK. Nelson and Lady Boyle.

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AIR TRANSPORT

London-Moscow Progress

ON February 26 an inter-airline agreement was signed in Moscow between B.E.A. (by Lord Douglas) and Aeroflot (by Marshal Zhigarev). Like the air services agreement signed between the two Governments in London on December 19, the new agreement is provisional, being subject to ratification and dependent upon certain technical problems being satisfactorily settled. These problems concern such things as navigational and airport facilities, routeing, air traffic control systems, meteorological information and approval of the characteristics of the aircraft to be used. A Russian delegation was coming to London this week for further discussions.

The signing of the agreement in Moscow followed the visit of a joint M.T.C.A./B.E.A. team in a Viscount 802. Lord Douglas followed this team to Moscow, flying by Aeroflot Tu-104 from Copenhagen and returning by the same airline to Prague. The Viscount was, incidentally, making its second visit to Moscow, Vickers having taken one out in 1956 to collect the British delegation to the Moscow air display in that year. We understand that this latest journey, via Copenhagen, was uneventful beyond the fact that the approach to Moscow was made at about 30,000 ft.

Lord Douglas is reported to have told the Press in Moscow that the service could begin within a few months—" not before June, but sooner than September." Aeroflot is particularly anxious to start as soon as possible, and proposes to use the Tu-104, or, if noise restrictions make this impossible, the four-turboprop Il-18. B.E.A. will use Viscounts and later, no doubt, the Comet 4B. Services will probably be on a twice-weekly basis and both will stop at Copenhagen. Both Aeroflot and B.E.A. have traffic rights at Copenhagen for passengers to their respective capitals, and will require only transit rights for the new services; S.A.S. already operates services from Copenhagen to London and to Moscow. The London-Moscow fare will be £142 return, tourist class, and the time taken by Viscount will be about six hours.

The B.E.A. service will most probably be operated as an extension of the daily service to Copenhagen, as the traffic to Moscow is not likely to be very heavy. Indeed, it is doubtful whether this new service can be justified economically to begin with. Apart from considerations of national prestige, B.E.A. are no doubt looking to the future when Moscow may become a useful traffic focus for services to the Far East. Already, Air India is planning a link from Delhi and there is talk of Aeroflot plans to fly from Moscow to Tokyo. A fast connecting service between Moscow and London might prove very attractive in the light of developments such as these.

Last week-end it was stated that B.O.A.C. had asked M.T.C.A. to start negotiations with the U.S.S.R. for rights to fly to the Far East via Russia and China.

The route to Tokyo would be about 3,000 miles shorter through Moscow and Peking than by present means—but this saving would need to be balanced against the loss of sector traffic and studied in relation to the amount of through traffic which is offering.

Discussing the Independents

LAST week's little debate in the House of Commons (on February 28)—following the motion that " note should be taken " of the independent operators' contribution to air transport—did not contribute very much to progress.

However, it was a good thing that the House should have been reminded of the work done by these carriers, and the debate provided one or two members with the opportunity for criticizing the performance of some of the independents—and, whether justifiable or not, criticism is nearly always salutary. Among the suggestions made were those for an independent licensing authority and for differential fares between turbojet and turboprop operations.

An encouraging sign of changing thought on the Opposition side was the remark by MR. FRANK BESWICK (Lab., Uxbridge) to the effect that the smaller companies which filled the gap and complemented the Corporations' services should be able to do so with some sense of stability and security. He had previously suggested that there might be a case for a third air corporation, but did not accept the view that this should be privately financed and owned.

The debate was wound up by MR. AIREY NEAVE, Parliamentary Secretary to the Ministry of Civil Aviation, who gave a few encouraging figures to show the progress of the independents and said, in effect (paraphrasing Dr. Pangloss), that everything was for the best in the best of all possible worlds.

The Silver City Accident

THE loss of life in the accident near Bolton, on Thursday, February 27, to a Silver City Bristol 170 was especially tragic because those who died were among a party from one part of the country and from one industry.

The accident had, therefore, the same kind of impact on public opinion as that, only three weeks earlier, to the B.E.A. Elizabethan carrying members of a well-known football team and others. The public is prepared to accept the statistical inevitability of aircraft accidents, just as they accept those in other forms of transport, but the loss of groups of people, and these their own countrymen, makes a special impact on emotion and must have a seriously adverse effect on confidence in air transport.

The Silver City aircraft was flying from Ronaldsway, Isle of Man, to Ringway, Manchester, carrying a group of motor traders on a visit to a factory. It struck Winter Hill, near Bolton, which rises to a height of 1,489 ft. above sea-level. There were only seven survivors, including three members of the crew, among the 42 occupants of the aircraft. A public inquiry is being held, so it will be inopportune to make a guess at the possible cause—but questions will, naturally, be asked about the reasons why the aircraft was flying at an altitude of less than 1,500 ft. The crash occurred at about 09.45 hrs.

The fatal-accident record of British air transport has certainly been a bad one during the past 12 months. Apart from the loss of a Britannia on test and of a Heron on an ambulance flight in Scotland, there have been at least five major accidents involving heavy loss of life—the Viscounts at Ringway and Nutts Corner, the Solent in the Isle of Wight, the Elizabethan at Munich and the Viking at Blackbushe.

The Solent Inquiry

THE public inquiry into the accident, on November 15, to the Aquila Airways' Solent, G-AKNU, was concluded in London on February 27. Most of the significant evidence heard during the inquiry related to the failure or otherwise of various engines, and Mr. P. Stuart Bevan, for the Crown, suggested that one or two of the engines had inadvertently been cut by one of the pilots. Mr. A. S. Orr, for Aquila Airways, also said that the most likely cause of the accident was the failure, apparent or real, of one engine, followed by the inadvertent cutting of a second engine when the first was being feathered. Another theory was that the engine switches were operated instead of the heater switches.

According to the evidence, No. 4 engine was reported over the R/T to have been feathered, but investigation showed that neither No. 4 nor No. 3 was under power at the moment of the impact. Neither of these engines showed signs of structural or lubrication failure.

Reference was also made by Mr. Bevan during the course of the inquiry to the maintenance of the aircraft and the documentation of maintenance which, he said, left a certain amount to be desired in a number of respects. He said that the pilots should be exonerated from any wrongful act or default in connection with the accident.

Background to B.E.A.'s Turbojet Order

SOME interesting and, in parts, significant comments on B.E.A.'s turbojet transport thinking appear in the February issue of the Corporation's house magazine. These comments take up the major part of the section in this magazine in which, month by month, the chairman, Lord Douglas, explains policies and events within the Corporation—but the comments can also be assumed to reflect the thinking of B.E.A.'s technical and other executives.

In the matter of history, Lord Douglas explains that B.E.A. first issued its specification of requirements for a new short-haul turbojet transport in August, 1956. Discussions took place during many months with Vickers-Armstrongs, Bristol, Avro and de Havilland and concerned a whole series of projects designed to meet this requirement. These investigations finally resulted, last summer, in a decision by the Corporation that the D.H. 121 should be ordered.

After outlining more recent events, Lord Douglas writes:—

"The full significance of this great undertaking should be generally understood. The background is that, after the War, the U.K. undertook an ambitious programme of transport aircraft development which aimed at putting a large number of British airliners into service on the World's air routes. The result of this programme was that, of the various new British trunk-route airliners which were developed, only the short-haul Viscount has achieved really worthwhile sales. The Britannia, in medium and long-haul form, has so far sold in only modest numbers, as have a few short- and medium-haul types—the Elizabethan, the Bristol 170 and the Hermes 4. The stop-gap Viking also achieved worthwhile sales. Nevertheless, less than 300 fully-competitive modern British airliners have been put into commercial scheduled service at a time when more than 2,000 new American aircraft have appeared on the World's air routes. By far the major part of such success as Britain has achieved has been that of the Viscount, which was designed and developed as a short-haul aeroplane specifically to B.E.A.'s requirements.

". . . . turboprops will probably continue to have an important rôle to play for certain types of operation—particularly for short routes—after 1960, but nobody now doubts that this next decade will be the beginning of the 'jet era.' If Britain is to sell first-line transport aircraft during these next 10 years, there must be British jets which are fully competitive with those being built elsewhere.

"The importance of the D.H.121 and the V.C.10 is therefore clear, the former for short-hauls and the latter for long. Although these aeroplanes will enter service in the mid-1960s, some years after the American big jets, there are good reasons for believing that they will have excellent sales prospects. These include:—

"(1) The unrivalled background of experience with the first generation of civil turbine aircraft, which was exclusively British. This 'know-how' will be built directly into the new British types. There is no substitute for such experience.

"(2) The technical ascendancy of British gas turbine engines. This particularly applies to the Rolls-Royce by-pass jets which have outstanding advantages for transport aircraft because of their more economic fuel consumption and lower noise level.

"(3) The fact that British manufacturers are able to sell at highly competitive prices in non-dollar currency. The purchase of American aircraft by operators outside the dollar area involves a continuous drain on gold and dollar reserves, not only for the initial purchase but also for spares.

"B.E.A. believes that the sales prospects of the D.H.121 will be particularly good because it will, in addition, be the first short-haul jet in the World. Two-thirds of the World's air transport business is 'short-haul,' that is to say is on stage lengths of less than 1,200 miles.

"Traffic on many of the shortest short-haul routes—of under about 500 miles—will, it is true, probably continue to travel for a long time in the more economic and operationally flexible turboprop. . . . On routes of 500 to 1,200 miles and on the more highly competitive routes of under 500 miles—where jets may have to be introduced in spite of the operational arguments against them—short-haul jets are going to be essential.

"B.E.A. believes that an aeroplane of the size and range of the D.H.121, which will weigh about 120,000 lb. and is designed to carry about 100 passengers in high-density layout for 1,000 miles, will be an altogether more manageable and flexible proposition for these operations than the very large longer-range jets.

"The long-range jets, such as the Boeing 707, the DC-8 and the V.C.10, will weigh in the region of 300,000 lb. and the medium-range types, such as the CV-880 and the Boeing 720, in the region of 200,000 lb. These aeroplanes are as large and heavy as they are, primarily because of the enormous fuel loads which their long-range capabilities dictate. . . . Because they are so large, the big jets must carry round with them a great deal of unnecessary 'ironmongery' when they are flying on short stage lengths. This makes their short-haul economics considerably less attractive than they could be if they were specifically designed for this work."

First Viscount for Austria

ON February 12 the first of Fred Olsen's Viscount 779s for use by Austrian Airlines arrived at Schwechat Airport, Vienna. It was flown in by Capt. Barryll and among those on board was Herr S. Froeschl, the general manager of Austrian Airlines. Fred Olsen and S.A.S. hold 30% of the Austrian company's shares and Fred Olsen is supplying the flight equipment and crews for initial operations.

An interesting feature of this arrangement is that the 10 Norwegian pilots who will fly for the new airline are to become temporary Austrian citizens; the treaty by which the new company was formed carries a paragraph which states that the crews must be of Austrian nationality.

SECOND CENTURY.—The Hurn factory of Vickers-Armstrongs (Aircraft) Ltd. recently completed their 200th Viscount—a Type 757 for T.C.A. Some of the company's senior officials are seen with it here, including, at extreme left, Mr. W. R. Coomber, production manager and Mr. E. W. J. Gray, chief designer.

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By Britannia to Vancouver

F. G. Swanborough discusses aviation on Canada's West Coast

THE invitation to spend a couple of days in Vancouver was a little out of the ordinary: one does not habitually make a 10,000-mile round trip for the week-end. When I was invited to go along on a Britannia which was flying out on February 20 and returning three days later, I therefore welcomed the idea. Not only would this be an opportunity to get better acquainted with the long-range Britannia—in which I had not yet flown—but it would also mean I could attend the formal opening of Canadian Pacific's new hangar for Britannias at Vancouver, and get at first hand some impressions of air transport developments on Canada's west coast.

The hangar-opening ceremony was the principal reason for the Britannia's journey, but it so happened that this coincided rather nicely with some long-range flying which had to be done by the first Canadian Pacific Britannia before its final acceptance by the airline. Since this Britannia, known as the Type 314 for C.P.A.L., made its first flight on January 11 at Belfast, it had been moved down to Filton for flight testing and clearance of the various new features specified by C.P.A.L. As this was the first of the 310-Series Britannias built by Short Bros. and Harland, there was also special interest in comparing its performance with the norm of Filton-built 312s for B.O.A.C.

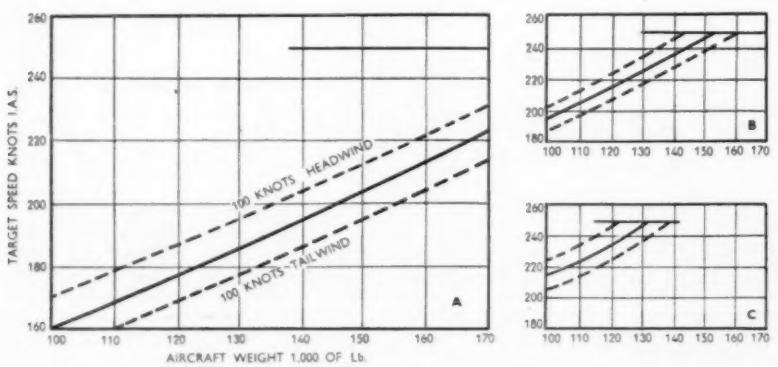
We departed from Filton at 09.06 G.M.T. on Thursday morning, February 20, carrying 50-odd passengers and a flight crew of nine. The latter included three C.P.A. captains and a navigator; a Bristol radio operator and two Short Bros. engineers; Shorts' test pilot Mike Ingle-Finch; and, in command, Bristol's chief test pilot, Walter Gibb. (On any visit to North America, one quickly adopts the custom of using first names; I have done the same here.) The flight plan, with forecast winds which were "too good to be true," was for a ten-hour flight to Montreal; we eventually took six minutes longer than this.

Standard stepped-climb procedure was used on the Atlantic crossing, starting at the quadrantal height of 22,000 ft. (reached 40 minutes after take-off, on course, 30 miles S. of Eire). We had taken off from Filton's 7,275-ft. runway uphill from the Patchway end, at a gross weight of 174,000 lb.—6,000 lb. below the permitted maximum. Included in this total was the maximum fuel load of 68,640 lb. (8,580 Imp. gallons).

Although the techniques of cruise-climb and stepped-climb are well understood, there are practical difficulties in achieving optimum performance in the latter, because of the several variables that have to be considered and the time taken to read curves and make calculations. After a great deal of thought, and resulting from a wealth of experience on long-range flights, Bristol have now developed a very simple method of cruise control, which we employed on the Filton-Montreal leg and, later, on the Vancouver-London return flight.

The system, which is still in need of refinement and was being tried for the first time on this flight, was explained to me by Keith Turner, chief of Bristol's flight research department, who was largely responsible for its development. It consists simply of a graph (see below) which gives the pilot a target speed for any given aircraft weight, and with allowances for headwinds and tailwinds. This speed is read off for the appropriate aircraft weight as soon as the initial cruising altitude is reached, and the aircraft is then flown level until the speed is reached. The aircraft then climbs 2,000 ft. (assuming quadrantal heights are being flown), the target speed for the new weight is read off and the whole procedure is repeated.

Keith Turner also showed me the supplementary graphs, of the same form, which can be used if it is desired to complete the flight at higher speed. These can be used as soon as it is known that the destination is "in the bag" and they have been calculated on the relationship of fuel available to fuel required to complete the flight, with safety allowances and using the economy technique. This relationship can be expected to be of the order of 1.1-1.2, and the two supplementary graphs show the higher target speeds which can be used on each stage of the flight. Using this technique you are in effect burning off excess fuel to obtain extra speed, but it does not follow that such an operation would necessarily be less economic; depending on the circumstances, the shorter time could cancel out higher consumption.



Graphs of this kind (the curves drawn here are only approximate) simplify the job of cruise control in the Britannia. That on the left is for optimum economy on a stepped climb, while the smaller ones on the right can be used if a higher speed is wanted at the expense of economy.

Throughout our flights a careful check was made of performance, a complete set of readings being taken every hour. These showed that we used nearly 7,000 lb. in the first hour after take-off and were using rather more than 5,000 lb. an hour on the early stages of the cruise, at 22,000 ft. and 24,000 ft. Subsequently, the consumption dropped to little more than 4,000 lb. an hour, and we landed at Montreal with 19,500 lb. of fuel remaining—sufficient for another four hours' flying.

I had not previously flown the Atlantic by daylight, and on the whole I found it preferable to the night crossing, if only because it avoids the discomfort of sleeping in the air and lessens the complication of time differentials. Since most Atlantic traffic is still nocturnal, we did not expect to see other aircraft during the crossing, so it was interesting to sight, in mid-Atlantic, the contrails of four high-flying fast aircraft (probably B-47s) which overtook us some five miles away to port. Later, over the coast of Labrador, we were intercepted by a jet fighter which appeared to be practising collision-course interceptions with us as the target—a questionable procedure.

The Montreal circuit was humming with activity as we slipped in among a departing North Star, a circuiting Beech 18 and a Viscount. The airport and surrounding countryside still displayed, a little self-consciously, the effects of the blizzard which had struck a few days before. Despite an invigorating crispness in the air, we were glad to be on our way again after stopping long enough for Customs and immigration procedures and a pleasant lunch. We took off for Vancouver at 167,000 lb. gross weight, with 61,500 lb. of fuel, and flew at a constant height of 22,000 ft. for best speed. Against a stiff headwind, we completed this 2,325-mile stage in eight hours.

The C.P.A.L. Britannia

Canadian Pacific Britannias differ from the B.O.A.C. long-fuselage model in having no radio-operator's station. This has been replaced by a radio rack on the port side, communications being, North American style, the prerogative of the captain. The navigator is to starboard, and there is a jump seat between and behind the two pilots for a flight engineer if required. Few changes in cockpit equipment have been specified by C.P.A.L., but Bendix RDR-1 weather radar has been installed in lieu of the Ekco set used by B.O.A.C. Behind a triple-tiered crew-rest bunk, there are three toilets at the fore end of the cabin, and two more at the rear. The bar and pantry unit are grouped around the main entrance door, and the usual arrangement will be for a first-class or de luxe cabin aft of this entrance and tourist and/or economy class sections forward.

The aircraft had not yet been fully furnished to the C.P.A.L. standard and it was not therefore possible to appreciate the interior arrangement. I was frankly disappointed, though, to find that C.P.A.L. have not made more of the opportunity presented by the Britannia's capacious interior. The exciting decor which Boeing, Douglas and Lockheed have demonstrated in their latest mock-ups (I have not seen the Convair 880 since it was finished) gives reason to hope that airlines will soon break with a tradition of interior decorating which does not deserve to be perpetuated.

For the most part, the C.P.A.L. Britannia is traditional, although there is some pleasing use of colour in places. We travelled in the U.S. tourist-style seats which C.P.A.L. have adopted and found them just about acceptable, no more. Tourist seats cannot be recommended for 14-hour flights, such as that of our return from Vancouver, especially by the occupant of the centre seat of a triple unit.

Among the passengers on the outward flight was Jack Gillies, chief engineer of Canadian Pacific, who outlined for me his company's equipment situation. The C.P.A.L. network falls into two distinct groups, domestic and international, with the latter fanning out literally to the four quarters of the globe from Vancouver to serve Europe, South America, Australasia and the Orient. The Britannia has been purchased for the international routes initially, but with the knowledge that, by 1960-61, international competition from the big turbojets may lead to its relegation to domestic services. An order for a small number of big turbojets for C.P.A.L. may be announced this year; Gillies personally favoured the DC-8.

On the domestic routes, the company fears competition from T.C.A.'s DC-8s and the purchase of a medium-haul turbojet in the 2,500-mile bracket (e.g., Comet 4B and Boeing 720) does not seem impossible, for this reason. For the immediate future, however, the six Britannias will more than replace the capacity of the ten DC-6Bs at present used on the international routes, and the latter will be put on to the domestic services, both existing and planned.

Problems Of Competition

The whole future of C.P.A.L.'s domestic (and to a lesser extent, international) operations is dependent on the outcome of its application for trans-continental route rights, made some time ago, and other rights, such as Vancouver-London and Vancouver- or Montreal-Rome, which will be sought. Until the new parliament has been elected, Government policy has been

Above, as the flights to and from Vancouver were being used, amongst other things, for crew training, the flight deck was more than usually busy. In this picture the rack for the Collins radio equipment can be seen on the right.

Right, after the new hangar had been formally opened, the Britannia was enthusiastically received by the several thousand guests and C.P.A.L. employees.

Photographs copyright "The Aeroplane"

Montreal arrival.

Britannia to Vancouver

more closely defined and the Air Transport Board has begun its hearings, the situation is wide open.

I learnt more about this subject at the Vancouver headquarters of Canadian Pacific from Ron Keith, assistant to the president, and Jack Crump, regional P.R.O. (and brother of the president of Canadian Pacific Railway Co.). They told me of the competition which the Vancouver-Amsterdam Arctic service is now getting from P.A.A. and T.W.A. with their Arctic services to Europe out of Seattle, San Francisco and Los Angeles. These now take most of the passengers who used to come up from as far south as Los Angeles to travel on the C.P.A.L. Arctic route rather than go through New York.

Further competition is provided by Qantas. About a dozen passengers on every C.P.A.L. flight to Amsterdam have been through-travellers from Australia; some of these may now prefer to go by Qantas through San Francisco and New York to London. In May, the company will be still more hard pressed when T.C.A. start a Vancouver-London service with stops at Winnipeg and Gander. The crux of the problem for C.P.A.L. is the lack of European terminals, but the introduction of Britannias should go some way to reclaiming lost traffic, at least temporarily.

So far as domestic routes are concerned, the application now before the Air Transport Board is for service to and between Vancouver, Edmonton, Saskatoon, Regina, Calgary, Winnipeg, Toronto, Ottawa and Montreal, but the precise pattern of such a service has not been published. A non-stop trans-continental service has not been requested—yet. The C.P.A.L. idea is to try to give better service between towns on the west side—where the company's domestic network is at present centred—and towns in the east.

I later asked Harold Miloff, who looks after T.C.A. public relations in Montreal and happened to be visiting Vancouver, how T.C.A. felt about this prospect of competition. At present, only the Toronto-Montreal route could support two carriers, and in a very high percentage of centres served by T.C.A. the population was so small that competition would never be acceptable. If additional operators were to be allowed to fly on profitable routes, it was important that they should also take a share of the non-profitable ones—of which T.C.A. have a good many.

In addition to C.P.A.L., Pacific Western Airways—which is the third largest carrier in Canada and has its headquarters at Vancouver—has applied for trans-continental route rights. Unfortunately, I did not have time to visit this company or the other local operators such as B.C. Airlines and B.N.P. Airways, but I asked Stephen Wheatcroft—a little unfairly, perhaps—how he thought they would benefit from the new government policy. Wheatcroft, well known as economic adviser to B.E.A., is in Canada to prepare an economic report on Canadian air transport. He told me that the local service operators hope to "pick up some crumbs" rather than to sit down to the feast with T.C.A. and C.P.A.L. Thus, P.W.A. might take over some local routes from C.P.A.L., if the latter expands eastwards, while B.C. Airlines in turn might pick up a few of P.W.A.'s existing routes.

One immediate effect of a successful outcome of the C.P.A.L. application would probably be the purchase of additional Britannias (five are on option in addition to the six on order). There is no doubt that the Britannia will do a good job for Canadian Pacific, but the company's enthusiasm for its new aircraft is, I felt, tempered with disappointment over late deliveries.

I was disquieted to learn that delivery is now about five months later than was originally planned and services cannot begin before June—too late for the beginning of the summer season traffic on the polar route. The delay will prove expensive in lost bookings, postponed training plans and so on. The best estimate of delivery dates I could obtain—from Peter Masefield—was four aircraft by the end of May and all six by July. The first should be handed over late this month and will remain at Filton for a few more weeks for crew training.

To find out how the Britannias will be utilized, I went to see W. V. Riley, Canadian Pacific's assistant vice-president, traffic. By the time the Britannia is in service, economy class fares will be in operation over the Atlantic—if government approval of the I.A.T.A. proposals is obtained. Riley told me that interest in economy class is greater than was expected, and there is little doubt that it will almost completely replace tourist class. Pan American have already said that they will keep no tourist-class seats on the Arctic routes; C.P.A.L. will not go as far as this, but the probable configuration of the Britannia will be 60 economy seats, six abreast, in the main cabin; 12 tourists in the area of the galley, and 16 de luxe seats aft. Economy and tourist seats will be the same, at 34 in. and 39 in. pitch respectively; de luxe class differs from first class in the standard of seating, and is more expensive. For a surcharge, berths will also be obtainable in the rear cabin—four overhead and four by converting seats.

This arrangement compares with the 54 seats on the DC-6Bs flying the Vancouver-Amsterdam route at the moment, made up of 42 tourist and 12 de luxe.

I also learned from Riley of the plan to introduce four Douglas DC-6A convertible passenger/freighters on the C.P.A.L. northern network this summer. They will replace DC-3s and C-46s, and their flexibility of accommodation will be especially useful in coping with the large amount of freight and the seasonal fluctuations and one-way loads which occur.

The Britannia Hangar

As already explained, the chief reason for the Britannia's presence in Vancouver was the opening of the new hangar in which the aircraft will be serviced. This $1.4-million building was designed by O. Safir, a local consulting engineer, and was built by the Marwell Construction Company, also of Vancouver. Its main bay is a single arch, spanning 180 ft. at floor level and 330 ft. long. Down each side are offices and workshops, the whole being of pre-cast concrete construction suitable for dis-assembly and erection elsewhere if this should prove necessary.

Into this hangar on February 22 crowded between 3,000 and 4,000 people to see the opening ceremony. The occasion was

Adjacent to the International Airport at Vancouver is the seaplane base, from which several local service operators fly Beavers, Cessnas, Pipers and other types. In the foreground is a privately-owned Piper.

Photographs copyright "The Aeroplane"

Britannia to Vancouver . . . .

made the opportunity for an Open House for employees and their families—who accepted the invitation happily and wholesale. They heard Grant McConachie, their own president, refer to the growth of C.P.A.L. from 73rd to 7th biggest airline in terms of route mileage; saw N. R. Crump, chairman of Canadian Pacific Railway Co., press the button which opened the door; and applauded as the Britannia made its triumphant entry, preceded by a brass band.

It was a trifle unfortunate, I thought, that the individual name of this aircraft was "Empress of Buenos Aires." How much more fitting "Empress of Vancouver" would have been; but this name is reserved for the second aircraft, CF-CZB. Others will be CF-CZC, "Empress of Madrid"; CF-CZD, "Empress of Santiago"; and CF-CZW, "Empress of Edmonton." The sixth aircraft, CF-CZX, is not yet named.

The opening of the hangar was followed by another ceremony, at the adjacent works of Bristol Aero Engines (Western) Ltd., to inaugurate the new Proteus test cell. Bristol Aero Engines will be responsible for overhauls of all the C.P.A.L. and Aeronaves Proteus engines, the first turbines they have handled. I was shown round the neatly laid-out works by Jim Hutton, assistant general manager, who explained that the principal work now in hand is the overhaul of R-1820 and R-2600 radials for the R.C.A.F. and some civil users.

To begin with, while the overhaul period on the Proteus 755 remains at 850 hours, the works will handle about 12 Proteus a month, in addition to piston engines, and equipment is in fact available to cope with about 45 engines a month in all, if required. The new Proteus test cell, to which a second could easily be added, follows the standard pattern, and the ceremony of pushing the button to start an engine on test was performed by Grant McConachie.

Vancouver's Airport

Vancouver International Airport is the home of a surprising (to me) number of companies and a profusion of aircraft. Like so many airports in North America, it is shared by military and civil users, and the sight of R.C.A.F. Sabres, Silver Stars and Harvards operating amidst the commercial comings and goings, while light aircraft and helicopters floated hither and thither apparently at will. intrigued me greatly. The airport is actually situated on Sea Island, one of a group in the mouth of the Fraser River, and the construction of runways and buildings on the spongy sub-soil poses a considerable problem. The river itself is navigable to floatplanes, of which a goodly number was in evidence; but the old Queen Charlotte Airline's Stranraer, taken over by Pacific Western, stood high, dry and derelict.

Plans are afoot to build a new terminal building and possibly a new runway, although the existing runway, at 8,600 ft., should be adequate for several years to come. Two terminals are used at the moment—one by C.P.A.L., Pacific Western and Qantas, and another, built more recently, by T.C.A. and United.

One of the most interesting operators with headquarters at Vancouver is Okanagan Helicopters, which has one of the World's largest fleet of helicopters. Over a steak sandwich and coffee at the nearby Skyline Hotel, Carl Agar, the company's operations director, told me of the work they are doing. Agar is too modest to admit to the title of Canada's Mr. Helicopter, but he has played a leading part in the development of the helicopters in the field of natural resources in which Okanagan specializes. He told me the company now has about 50 helicopters which include 21 S-55s, one S-58 and some Bell 47G, G-2 and J models. There are about the same number of pilots—a dozen or so were recently recruited in Britain—and these pilots are expected to fly 600-800 hours a year each on geographical and topographical surveys, fisheries and patrol, supply flying to the Mid-Canada line and general charter work.

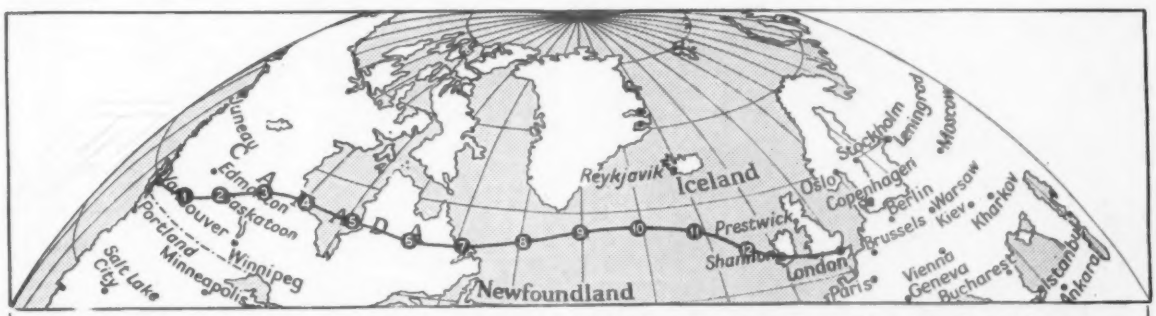
Canadian Rockies.

I asked about new equipment. From the operational aspect Agar is not impressed by multi-rotor helicopters, and is reasonably happy to stay with the Bell 47 and Sikorsky S-55 for the time being. More than anything else he wants a helicopter that is cheaper—both in first cost and operating cost—and he reckons that, to pay its way, a helicopter has to gross its initial cost in a year's operation.

All too soon the time for our departure from Vancouver arrived. As we were flying eastward, there was a good chance of picking up a healthy tailwind and the prospect of making a very long flight—non-stop to Rome, for instance. Once again, tanks were topped up, overwing refuelling being used to get in the last few gallons when some difficulty was encountered with the pressure refueller available at the airport. We took off at 21.30 hrs. G.M.T. (13.30 local) at a weight of 173,000 lb., climbed to 21,000 ft. and set course to follow the great circle track to London and beyond.

After some exciting views of the Rockies and glimpses of the central snow-covered plain, we climbed above cloud, which was continuous for the remainder of the flight. In the still air above we cruised steadily on, gaining height at intervals and flying through the short night into a luminous sunrise. We reached peak altitude over Shannon at 35,000 ft., and by this time it was clear that we could go no farther than London—or perhaps Amsterdam or Paris—having had virtually no help from the winds at all; the average total component was 13 knots. The weather all over Europe was bad and London was eventually selected for an ILS and GCA let down which brought us through the cloud at 600 ft. over Staines reservoir.

We had taken three minutes short of 14 hours to reach London Airport from Vancouver, and landed with enough fuel for another 2¼ hours' cruising flight. The Britannia had functioned faultlessly throughout the 10,000-mile round trip and the performance figures measured on the flight showed that the C.P.A.L. Britannia exceeds its guarantee figures on all counts. We disembarked in the pouring rain to clear Customs, and by the time I had reached Central London the Britannia was back at Filton.



The route followed by Britannia CF-CZA on its flight from Vancouver to London. The numbers show the positions at hourly intervals; with wind vectors, these were as follows:—

1.—50° 40′ N.	116° 35′ W.	090/55 k.	5.—56° 20′ N.	78° W.	331/150 k.	9.—58° 10′ N.	40° 15′ W.	221/12 k.
2.—53° 25′ N.	109° 40′ W.	060/60 k.	6.—55° 45′ N.	68° 20′ W.	301/83 k.	10.—58° 30′ N.	31° 10′ W.	181/140 k.
3.—55° N.	100° W.	040/50 k.	7.—56° 25′ N.	59° W.	321/40 k.	11.—57° N.	22° 05′ W.	181/15 k.
4.—57° 20′ N.	90° W.	321/20 k.	8.—57° 02′ N.	49° 50′ W.	201/10 k.	12.—54° 20′ N.	14° 10′ W.	—

Speed in Transport

IN his Presidential Address to the Royal Aeronautical Society—the fifth to be given—on February 26, Sir George Edwards, C.B.E., B.Sc., F.R.Ae.S., dealt first with the affairs of the Society and showed the encouraging growth in its membership to a current five-figure number. The main body of his discourse, however, was concerned with the way in which speed in transport had developed over the years and the way that the demand for more and faster transport has been stimulated by the World's communities becoming industrialized.

Starting with a fascinating analysis of the growth of travel since the end of the 17th century, Sir George turned his attention to more recent times. To begin with he examined, over the post-war period, two famous routes, the North Atlantic and the Irish Channel. A slide showed how the time to get from London to New York had changed since 1948 with an extension on the air curve to 1960. The big difference between the time that it takes to cross the Atlantic by air and sea was shown quite clearly—as was the way in which the traffic which is carried across the Atlantic is shared between sea and air. In 1957 they carried a little over a million passengers each.

Increase in air travel over this period, he said, is dramatic in that it has virtually quadrupled, but it is also interesting to note that there has been an increase in sea travel at the same time, although not nearly so great. It could be that the upsurge of air travel has had a stimulating effect on this total.

If we look at the Irish Channel, a journey by train and boat from London to Dublin takes 10 hr. 28 min., whereas the air route from London to Dublin takes 3 hr. and 10 min. (centre to centre)—a gain of 7 hr. 18 min. It is clear that the total traffic which has doubled, has been helped significantly by the attraction of the air route. This has grown from almost nothing to a quarter of the total travel. So we have the position where by flying on the North Atlantic, you cut out 9/10 of the journey time and on the Irish Channel you cut out two-thirds.

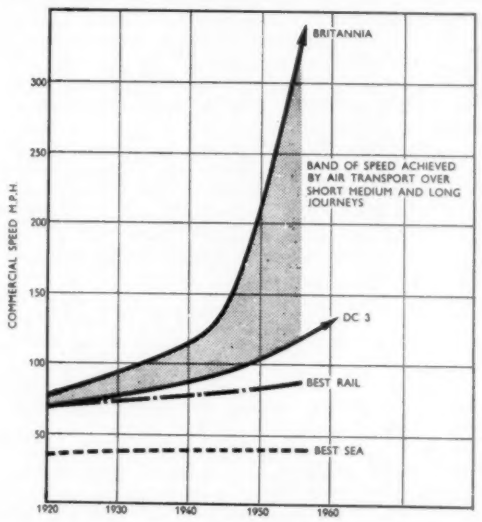
There is no good talking about speed unless one relates it to cost. The thing that I want you to note is that air is not cheaper than sea on either London to New York or Birmingham to Dublin. In actual fact, the cheapest form of crossing the Atlantic or going to Ireland is by surface travel.

Another slide showed the Irish air traffic subdivided into income groups. The interesting thing here, said Sir George, is that the increase over the past seven or eight years has not, as one might expect, come from the higher income groups but has in fact come from the lower income groups. The number of people in the higher income bracket stays fairly constant, whereas the lower income group figure has almost doubled over the past seven years. On the Birmingham-Dublin route, the lower income group content is some 70% of the whole. This, I think, is a pretty positive demonstration that speed will encourage travel even though it will cost more; and I think another interesting thing about the Irish route is the fact that it is a short-haul unglamorous leg in comparison with the North Atlantic. This, of course, is the dramatic route always quoted for comparisons in time saved in travelling by air.

I should also deal briefly here with "Expense-account travellers"—who, unlike the lower-income groups, are not historically concerned with fare rates. Their journeys are "on the firm" and it is not surprising that speed is chosen every time. What does emerge from a general study of business travel, however, is that when a destination gets beyond the 12-hour journey circle, journey incidence falls sharply. There is much business flying inside the "12-hour circle"—in fact half of it. There is a further ¼ on journeys of 24 hours and only ⅛ to the more distant places—even though they include South America, Australasia, the Far East and a lot of South-East Asia.

What is most notable is the way in which increasing speeds in the air have in fact been accompanied by sharp reductions in cost. So, for that matter, to a lesser extent have the rail and the lower orders of ship, although the upper ship curve has stayed pretty steady. But I think the way in which the technological improvements in aviation have brought reducing fares at the same time as increasing speeds is a most remarkable thing.

Increasing speed in transport has been the essential handmaiden to increasing development all over the World and the only medium in which speed can continue to increase is the air. There is no indication that a demand for increasing speed is going to diminish or disappear, so that the demand for faster aeroplanes is likely to go on. Having said that, let me make it quite clear that there will be, in my opinion, a whole lot of operations which are better conducted by an aeroplane not necessarily in the top-speed range. The dramatic cutting down of journey time compared with that of surface transport is an advantage shared by all modern aircraft. We have shown that these big savings of time attract the traffic to the aeroplane as a vehicle even despite higher fares.



"Air is the only free medium for progress." The increase in air transport speed over short, medium and long journeys.

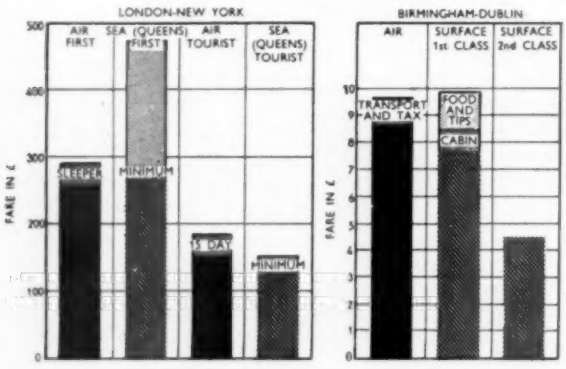
The speed range of aeroplanes themselves is, however, scattered over a fairly wide band, but they all have to a greater or lesser degree a dominating speed advantage over surface transport. People—and I mean people in the mass—are preferring air travel. But—and this is an important point—having chosen to fly, the actual airborne vehicle selected will depend upon overall economics.

Speed increases in the air, up to now, have—by improvements in the state of the art and by much labour—always been accompanied by better economics and efficiency. Any reversal of that trend would be a setback for civil aviation and would halt the present flow of mass travel towards the aeroplane.

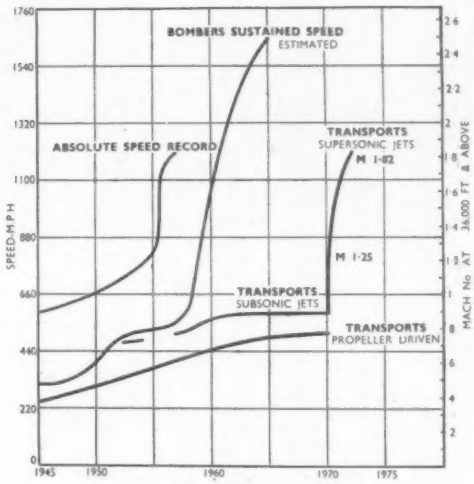
Speed improvements as between aeroplane and aeroplane must be related to the job in hand and also to the economic "rate for the job." Speed by itself and for its own sake can be a false god, and pursuit of it is unhealthy.

I believe there will, in fact, be significant speed gains for aviation—and I am about to evaluate their probable immediate size—but I do it with the warning that these gains must be based on sound overall economy and efficiency of operation. Without that twin basis we shall have left the main road of progress for a cul-de-sac.

Sir George next showed a diagram illustrating three speed



The cost of travel.



Current and future trends.

trends—the upper curve represented the World's air speed record; the middle one the speed of operational bombers; and the lower one, propeller-driven transports. Two short curves in between the last two represented the jet transport operation that there has so far been—the Comet and the TU-104. Part of the speed record curve denoted the era of the jet engine, previous to that the aircraft had all been propeller-driven, but the thing which really surprised him was the way in which an entirely new slope of curve had come about with the advent of the supersonic airframe.

The Swift, a subsonic aeroplane, was pushed literally round the corner, Sir George went on, but as soon as the genuine supersonic aeroplanes in the form of the Super Sabre and the Fairey Delta and the McDonnell Voodoo came into being then the rate of increase was dramatically stepped up. On the other hand, the bombers (propeller-driven up to the post-war era and then jet-driven) had followed a more or less parallel path with the World speed record although a stately distance away from it. The propeller-driven transports followed a very steady curve without any significant fluctuations. But the jet transports came into operation very close to the jet bombers.

In another slide I have taken the tail-end of the previous one and done some extension into the future. I have extended the bomber speed on the general supposition that by 1965 somebody could have a supersonic bomber capable of flying at M = 2.5 (although I have no idea if there will be such an aeroplane). I have extended the propeller-driven transport curve as a smooth continuation of the previous one and have not expected that the cruising speeds of propeller-driven transports will go above 500 m.p.h.

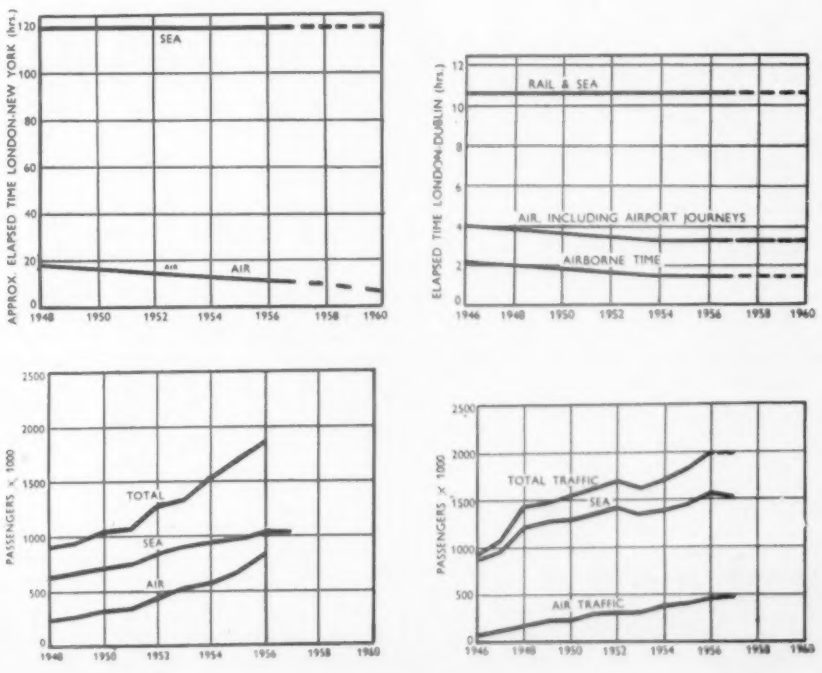
It seems to me that the subsonic jets such as the Boeing and the Douglas and the others are in themselves going to produce something in the nature of a speed plateau and I think the airlines' financial situation will stop them being replaced for some considerable time. So I have ventured to say that subsonic jets will continue to do their 600 m.p.h. or thereabouts right through the 1960s.

There seems, however, to be no technical reason why the supersonic development of the World's air speed record (and the supersonic bombers which could follow it) could not also be followed by supersonic transports, flying at speeds of over 1,000 m.p.h. If one decided that the previous gaps which had existed between the World's air speed record and bomber speeds and transport speeds would be maintained then there is no reason why civil jets should not be in existence at supersonic speeds in the 1960s. I believe, however, the financial burden of depreciating the subsonic jets will alone make that impossible, and a supersonic jet in operation before 1970 is of academic interest only.

When we do get a supersonic jet we get with it the ability to bring practically the whole World within reach of the 12-hour journey time. I have tried to show that there is an increasing demand for a longer distance to be flown in 12 hours. I am certainly convinced that nothing will stop the ultimate operation of long-range supersonic civil aeroplanes. I believe that the operating costs when the time comes will be within reasonable distance of the operation costs—as we know them—of the subsonic jets.

If I might hark back to my early word about our friends, the Americans, and the position that we the British hold today in the West—we have all the operating experience in turbine-engined transport with a propeller-turbine or pure-jet and I see no reason why we should not have our own great stake in this new field of supersonic civil travel. In my audience tonight are many important people who will have the responsibility of making decisions that will decide whether in fact there are to be British supersonic transports. If I have done something in this lecture to demonstrate that those decisions should be taken with a view to ensuring that there will be one, then my time will have been well spent.

If it is true that we are not going on with a supersonic long-range bomber, then let us spend the money on a supersonic long-range transport. This should not be hampered by following the basic design for a specialized military application in which economy is not a major factor. Let us make a virtue of necessity and put our effort into an optimum civil aeroplane.



These four graphs give a comparison of the elapsed times and traffic over two routes. The two left hand graphs relate to the North Atlantic-Europe route and the two right-hand ones to the U.K.-Eire route. In both cases traffic totals are shown in the lower figures.

THE FIGHTING SERVICES

Hull U.A.S. Dinner

AIR VICE-MARSHAL H. V. SATTERLY, Air Officer Commanding, Headquarters, No. 64 (N) Group, and other senior Service officers, were among the guests who were prevented from attending the Hull University Air Squadron dinner on February 25, as a result of the near Arctic conditions of the day. Held in the City's Guildhall, the dinner, presided over by the C.O., Sqn. Ldr. P. Dawes, was the finest the Squadron has yet held despite the handicap which stopped 30 of the guests being present.

Proposing the toast of "The Guests," SQN. LDR. DAWES expressed his appreciation of the co-operation shown by Blackburn and General Aircraft, Ltd. Last year the future of the Squadron was uncertain, he continued, but now it was established for a further period of five years at least; for the first time membership had reached the authorized establishment and applications were being turned down.

DR. BRYNMOR JONES, Vice-Chancellor of the University of Hull, proposed "The Squadron" and said he welcomed any worthwhile activity in a university so young, and the air squadron was certainly worthwhile. Profound changes in World affairs could occur overnight, and it was essential that we should be ever-watchful to defend our heritage. It was unfortunate that the University Grants Committee plans did not include a faculty in engineering.

Replying for the guests, MR. E. TURNER, chairman and managing director of Blackburns, emphasized that the future of aviation was going to be of even greater importance to this country. Lord Middleton, Chancellor of the University, was also unable to attend because of the weather conditions and the reply to the University was made by DR. J. H. NICHOLSON, a former Vice-Chancellor. ACT. PLT. OFF. D. A. ALLARDICE replied to the toast to the Squadron.

Changes in Aircraft Markings

FLYING TRAINING COMMAND aircraft and training aircraft of other commands, which have carried distinctive yellow markings since 1935, are to have a more striking colour scheme. In future, a fluorescent orange paint is to replace the yellow hitherto used for the bands round the rear fuselage and wings, and, in addition, the wing and tailplane tips are to be finished in fluorescent orange.

Some Problems of Helicopter Rescue

LAST MONTH Air Cdre. R. T. Gething, O.B.E., A.F.C., Director of Maritime Operations and Navigation at the Air Ministry, made a number of interesting points on the operation of helicopters during his lecture on the R.A.F. Search and Rescue Organization for the United Kingdom. Arranged by the Institute of Navigation, the paper dealt with many aspects of air/sea search and rescue covering its organization in Coastal Command, the main resources devoted to the work, and rescue equipment.

S.A.R. helicopters—Sycamores and Whirlwinds—are now deployed in pairs at nine locations around our coast and are at 15-min. readiness from dawn to dusk. The Sycamore, which has a radius of action in the S.A.R. rôle of 40 to 50 miles and when carrying a crew of three, is able to rescue only one person at a time, but the Whirlwind, with a similar range, can pick up three persons besides carrying a crew of three.

The present standard means of homing to and communicating with distressed persons is SARAH (Search and Rescue and Homing), but since the R.A.F. is destined to change from VHF to UHF communication during the period 1960 to 1961, the development of similar equipment for use with UHF is being undertaken. Known as SARBE (Search and Rescue Beacon Equipment), this aid will be carried by civil aircraft and will also be the standard equipment of NATO forces.

Turning to navigation, Air Cdre. Gething said that the Whirlwind is now fitted with Decca Mk. 8 and therefore, within the coverage of the chain, it presents no difficulty. But due to the weight penalty there is no quick-fixing aid available for the Sycamore and a number of navigational problems are presented.

R.R.A.F. TOUR.—Air Cdre. E. W. S. Jacklin, Chief of the Air Staff of the Royal Rhodesian Air Force (right), who recently visited stations in M.E.A.F., at Nicosia with Air Vice-Marshal W. J. Crisham (left), A.O.C., Levant, and Gp. Capt. H. Hawkins, R.R.A.F. On his return to Rhodesia Air Cdre. Jacklin planned to visit No. 1 Squadron, R.R.A.F., on detachment at Khormaksar, Aden.

A comparatively unsophisticated type of compass is at present the standard helicopter equipment, and this has a low standard of accuracy. It has been found impracticable to utilize the standard R.A.F. "P"-type compass because of the effects of vibration, and the fitment of the gyro magnetic G.4F compass, which would overcome this problem, is prohibited by the weight penalty involved. As a result of these and other factors, such as considerable D.R. position errors due to low forward speed and wind effect, accurate navigation of the helicopter over the sea becomes a difficult proposition.

The performance of helicopters is extremely critical in certain conditions of wind and temperature and the load which can be lifted varies very considerably from day to day and aircraft to aircraft. It can happen under certain circumstances, as indeed it has on a number of occasions, that instead of winching a survivor from the water, the helicopter itself is unable to produce enough lift and in fact descends to the water.

Instrument flying, and hence night flying, is also a current problem due to the inherent instability of the helicopter, which requires considerable concentration and therefore rapidly produces pilot fatigue. At present R.A.F. pilots are limited to a maximum of 30 minutes' instrument flying on any mission.

R.A.F. Appointments

THE following are among recent R.A.F. appointments:—

Group Captain G. C. Godfrey, M.B.E., to Headquarters, Allied Air Forces Northern Europe, for staff duties.

Acting Group Captain L. T. Card, C.B.E., to Air Ministry for duty in the Department of the C.A.S.

Wing Commanders: A. D. Adams to Air Ministry for duty in the Department of the Air Member for Supply and Organization; P. G. Brodie to R.A.F., Rufforth, as President of No. 2 Standing Court Martial; I. G. N. Drummond to No. 14 M.U., Carlisle, for administrative duties; R. J. Kelsey to Headquarters, Flying Training Command, for planning staff duties; S. McCreith, A.F.C., to M.o.S., Bedford, as officer commanding flying and unit commander; F. T. Solis to H.M. Transport "Devonshire" as officer commanding troops; G. T. Thain, D.F.C., to R.A.F. Lyneham, for flying duties.

Squadron Leaders: S. A. Bunting to Headquarters, No. 13 (Fighter) Group, for logistics staff duties (with acting rank of Wg. Cdr.); N. S. Fear to R.A.F., Medmenham, to command (with acting rank of Wg. Cdr.); P. W. Lovell, D.F.C., A.F.C., to R.A.F., Odiham, as O.C., Flying Wing (with acting rank of Wg. Cdr.).

Far-Away Frontiers-II

Continuing the story of his recent tour of Pakistan, JOHN FRICKER *of* THE AEROPLANE *describes in this issue visits to Kohat, Lahore and Sargodha.*

CONTINUING our tour of Pakistan Air Force units in the North-West Frontier Region, and the Punjab, we flew in our Bristol Wayfarer on the short trip from Miran Shah to Kohat, on February 4, in the beautiful cloudless and spring-like weather characteristic of this plateau area in the winter. Miran Shah is a satellite strip of Kohat, which is the main operating base for No. 9 (Fury) Squadron, P.A.F., and a former Royal Air Force airfield, from about 1924 onwards. The old R.A.F. camp, which is now used as a recruit training centre, is still enclosed within a fenced area, but the former landing strip is at right angles to the newer 2,000-yd. runway.

In all there are now three camp sites at Kohat, which is commanded by Gp. Capt. M. M. Piracha, including one built by the P.A.F. towards the end of 1953, and it has a capacity of 1,100-1,200 recruits for non-technical training, plus another 800 or so station personnel. Apart from No. 9 Squadron's 12 Hawker Furies, the only other aircraft on the station are several Bristol Freighters, which are stored for future use. The Furies moved from Peshawar, which has been having its runway extended, about a year ago, but in their task of defending the North-West Frontier, they have not had to fly any operations against marauding tribesmen since their arrival at Kohat.

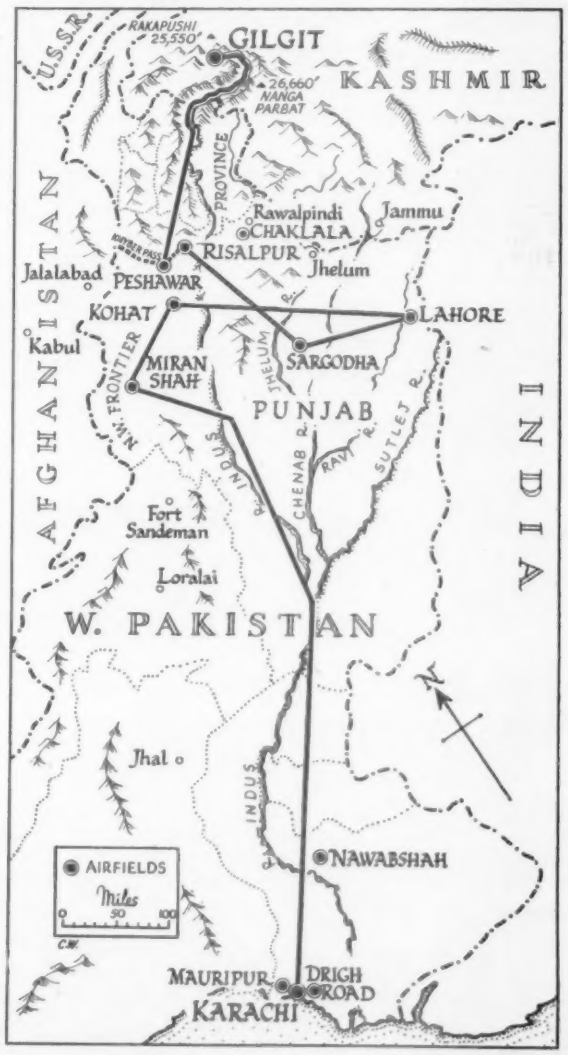
The squadron formed an aerobatic team, however, of four aircraft in 1951, soon after receiving the Furies, and demonstrated its prowess during our visit. I was also privileged to make a tour of the local area in one of the two two-seat Fury T.61s, which are used for instrument and conversion training on the squadron, and it was a memorable experience to fly in one of the last, and finest, fighters of the piston-engine era. The Fury has delightful handling qualities, and its reliability and rugged construction have made it very popular with its pilots.

To the north and west of Kohat are the unsettled districts of the tribal area, and a few minutes' drive from the technological complexities of the airfield, which includes among its amenities a station theatre equipped for CinemaScope, takes one into the heart of a wild and primitive area, where the feudal way of life has remained unchanged for centuries. Although included in Pakistan, the tribal areas retain a large degree of autonomy under their headmen, liaison with the Government being through the medium of political agents, and among other things still keep to their ancient legal and administrative systems. The Pathans, as the tribesmen are collectively known, have a culture dating back to the time of Alexander the Great, who invaded the Indian sub-continent through the Khyber Pass, and some of the villages in the locality still bear Greek names.

Their warlike instincts are being increasingly channelled into agriculture and industry in Northern Pakistan, but many of the habits of the turbulent centuries remain, and every adult male Pathan still carries a gun. These are made by hand in the locality by a long-established armament industry, and on visiting one of the "factories" in the Kohat Pass, we began to see the reason for the enthusiasm behind the salvage of expended rocket projectiles for their unburnt cordite (described in the first article in this series).

Pausing briefly en route at the forbidding Handyside Fort, manned by the Frontier Constabulary and marking the beginning of tribal territory from its lofty perch overlooking the Kohat Plain, we drove into a village which is entirely devoted to the manufacture of small arms. Inside its mud huts tribesmen toil with primitive hand-turned lathes and grinding, buffing and drilling rigs, to produce precise replicas of modern rifles, revolvers, automatic pistols, and sub-machine guns, which are indistinguishable after the closest examination from their original prototypes. Every numeral and official marking is faithfully reproduced, and the standard of finish is quite as high as the genuine articles.

The most popular weapons which we saw in production



Photographs copyright "The Aeroplane"

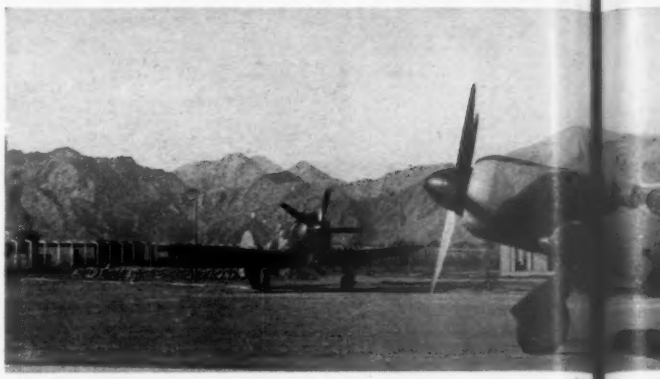
Top, an old ox-cart and a cautionary notice mark the beginning of Pathan tribal territory in the Kohat Pass. Right, the full itinerary of the tour through W. Pakistan by Bristol Wayfarer.

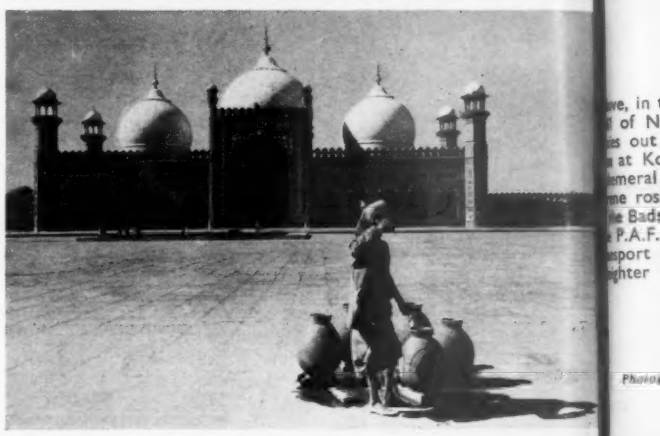
appeared to be the Webley .38 revolver and the Lee-Enfield .303-in. Service-type rifle, but many other types are available, including single- or double-barrelled shotguns, at prices varying from about 60-500 rupees (£4 12s. to just under £40). The tribesmen also make their own ammunition, with salvaged or fresh cordite, and reclaimed or home-made cartridge cases. The weapons are initially quite accurate, with carefully rifled barrels, but as the steel is not heat-treated, bore wear is rather rapid and the accuracy decreases after about 50 shots.

Nevertheless, the gun factory showed the extraordinarily high standard of native craftsmanship, even if slightly misapplied, and there is a brisk demand for the finished products from all and sundry. It is intriguing to think of the industrial potentialities of the area, if the tribesmen could be persuaded to turn their talents to some more constructive form of light engineering, and the revolution that the introduction of even one or two power tools could cause.

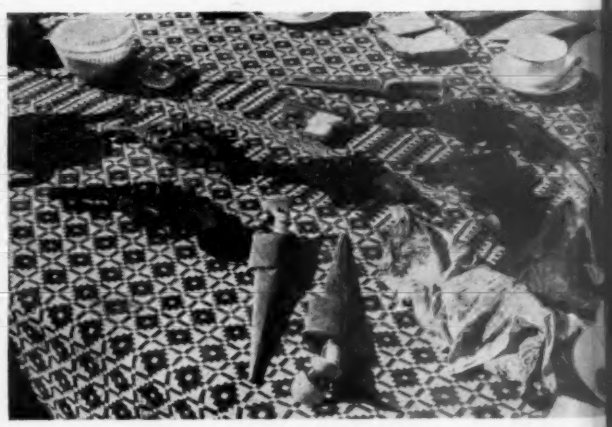
From the wilds of the Kohat Pass, we returned for a while to civilization by flying south over the fertile Punjab to Lahore, which is still served by Kipling's *Civil and Military Gazette*. The ancient city of Lahore is now the capital of W. Pakistan, and for the P.A.F., its airfield, commanded by Wg. Cdr. S. I. R. Bokhari, represents the main centre of air transport. Having bought more than 60 Bristol 170 transports from the U.K., the P.A.F. are the biggest operators of these machines, which are used for a variety of jobs, apart from their main employment as transports. At Lahore, under No. 1 (Operational) Group, there are two Bristol Freighter squadrons, No. 6 Squadron, which was one of the original Indian Air Force units, prior to Partition, and No. 3 Squadron, for twin-engined conversion.

No. 6 Squadron (Wg. Cdr. M. I. Rahman, who is also O.C. Flying), is the main transport unit in the P.A.F., and is equipped with 16 Bristol Freighter Mk. 31s for medium-range operations, plus one Wayfarer furnished for V.I.P. transport (which was the aircraft very kindly placed at our disposal for touring Pakistan). The squadron flying task is 800 hr. per month on

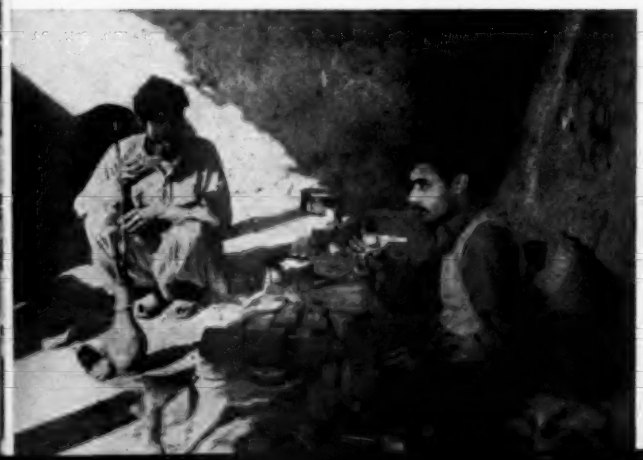




Below, precise copies of British Army Lee-Enfield rifles are sold for about £15 in the armament "shops" of the Kohat Pass having been produced by hand at the rear of the mud huts.



Above, tea and synthesy might well describe this group of mun… weapons, copied minutely from Western originals by Pathan tribesmen … Kohat Pass, against a domestic background of hospitable teacups. Below, … revolver frames are cut by hand out of the solid metal, while (below) … barrels are drilled from mild steel rods on these primitive machi…



ve, in the rear seat of a Hawker Fury
of No. 9 Sqn., P.A.F., the author
s out for a tour of the local flying
at Kohat. Left, a reminder of less
meral structures than aircraft is the
ne rose-red, gilt and white grandeur
e Badshahi Mosque at Lahore. Right,
P.A.F. station at Lahore is a main
port centre, and houses the Bristol
ghter 21s and 31s of Nos. 3 and 6
Squadrons.

Photographs copyright "The Aeroplane"

Left, one of the finest examples of Moghul architecture is the Imperial Fort at Lahore, and in the Shish Mahal or harem portion, built by Emperor Shah Jahan in 1631, is this exquisite little Naulakha Pavilion, which was originally decorated with semi-precious stones.

routes all over W. and E. Pakistan, and overseas, and a detachment is sent to Chaklala from April to October each year for the supply-dropping sorties to Gilgit, in N. Kashmir. As the crews are slightly under establishment they are having to fly 50-60 hr. per month, instead of the normal 40.

The squadron crews are all categorized according to R.A.F. standards. Until recently this was done during visits from the Transport Command Examining Wing, but the P.A.F. now has its own transport examiners, who qualified after spending three months on the job with the R.A.F. in the U.K. After gaining a category and an instrument rating, the crews begin to fly twice-weekly scheduled services to E. Pakistan (8-9 hr. non-stop in a Freighter), and round the Western Province. The E. Pakistan run is particularly important, since 30% of P.A.F. personnel are recruited from there, and air transport is essential for their leaves if they are not to spend the whole time travelling. There are occasional flights to the U.K. for spares and training, and also to Australia, the Far East and the Middle East.

The 130-140 knot cruising speed of the Freighter is rather a limitation on long flights, but the payload and ease of loading on medium and short-range trips are excellent. Manœuvrability and reliability are the two most essential factors for the arduous Northern Area operations into Kashmir, when four or five Freighters complete about 450 sorties per year in supplying the mountain villages by parachute or free drops, during the months when the mule or jeep tracks are blocked by snow. We were later to see something of these operations for ourselves, but for the moment, we were sufficiently impressed by tales of the Freighters operating at 10,000 ft. among mountains with a mean height of 16,000 ft. On the other hand, when the occasion required, the Pakistani pilots found that the Freighter would get up to 20,000 ft. without undue difficulty.

Remarkably few snags were encountered with the Freighters, although initially, when operating in extreme conditions, several P.A.F. pilots experienced a form of rudder lock at low air-speeds, which necessitated drastic recovery action. It was necessary to turn into the yaw and apply full opposite power, during which quite a lot of height could be lost. Bill Pegg visited Pakistan to explore this phenomenon after which the Freighter design was modified slightly by the addition of a dorsal fin, and this afforded a complete cure.

The modified aircraft are Freighter Mk. 31s, but six of the older Mk. 21s are still in service with No. 3 (Twin-Conversion) Squadron at Lahore. Pilots from the flying college at Risalpur are posted to this squadron for conversion to heavy twins, and are crewed up with navigators and signallers in batches of eight.

On the plains of the Punjab, the airfield at Sargodha is being extended for the operation of jet aircraft.

At the Pre-Cadet School at Sargodha, Pakistani boys are given public-school education as a preliminary to selection for flying duties with the P.A.F.

Photographs copyright "The Aeroplane"

during two courses per year. They then qualify as "D" category transport pilots, or up to that standard, dependent on their total flying hours, as in the R.A.F.

All crews then go to No. 6 Squadron, which confirms their categories within six months, and they are allowed two attempts to gain a "C" category within a year. "B" and "C" category crews are fed to No. 12 (Composite) Squadron, which also operates Bristol Freighters at Mauripur. During the initial conversion at Lahore, pilots complete about 180 hr. flying, while navigators put in about 80 hr.

It is impossible to leave the historic city of Lahore, which was invested with great importance and magnificence by the Moghul Emperors, without seeing some of the glories of the past, including Akbar's Fort, and the great Badshahi Mosque. The Fort, dating back in its origins to the 12th century, contains some fascinating and beautiful examples of Oriental architecture, while the ornate Badshahi Mosque, built in 1673, is claimed as the biggest in the World. Many other relics of the Moghul reign are still to be seen, but we had to be content with an aerial visit to the famous Shalimar Gardens, which proved a very effective way of appreciating their grandeur, while en route to our next port of call at Sargodha.

Flg. Off. Sohail put our Wayfarer down on the old strip at this airfield, which is having a new 8,000-ft. runway installed, for use by Sabres and other jet aircraft. This should be ready within the next few months; in the meantime, Sargodha has very little in the way of buildings or facilities, and our interest in calling there was to pay a brief visit to the public school which the P.A.F. has established next to the airfield. The two P.A.F. public schools (the other being at Lower Topa, in the Murree Hills) were the result of another idea by Air Vice-Marshal Atcherley to ensure a long-term supply of suitable candidates for technical and General Duties with the air force, and were established in 1953 entirely on English lines. British headmasters were engaged, through Air Service Training, Ltd., as advisers until the end of 1958, when the schools will become almost entirely staffed by Pakistanis.

The Pre-Cadet School at Sargodha is entirely residential, with the normal British house system, and boys enter it at the age of 11, to train for the Cambridge Overseas School Certificate examination at the age of 16 or 17. The older boys join a unit of the Shahin Air Training Corps, which operates in the larger towns all over Pakistan, and receive tuition in gliding in primary, Slingsby T.21, and Olympia gliders. School fees are graduated according to parents' incomes, and are generally low, and a broad educational standard is aimed at, before the boys move on to the P.A.F. College for flying duties, or to one of the other Pakistan services.

After admiring the excellent school facilities at Sargodha, and watching an energetic games session in progress, we returned to the airfield to fly north to Risalpur, where most of the boys will go to the Pakistan Air Force College. Once again we were in the picturesque North-West Frontier Region, which provides a slightly unusual setting for an establishment modelled on the R.A.F. College, Cranwell. Risalpur, commanded by Gp. Capt.

M. Khyber Khan, is responsible for the training of all P.A.F. pilots, who complete a two-year course, and also provides initial training for navigators and service training for all officers.

The pilots' course is slightly briefer than that at Cranwell, but about 210 hours' flying are completed on the T-6G Harvard up to the standard of "wings," which are confirmed at the final stage of training on Lockheed T-33s at Mauripur. The academic studies are similar to those in the R.A.F. College, being divided into the Humanities and Aero Science, and flying training starts after six months of ground instruction and drill. There are two courses of 75 students each year, and two cadets from each entry are sent to Cranwell for purposes of comparison. On their return, it is usually found that the flying and technical standards achieved are similar to those at Risalpur, but the ex-Cranwell cadets have a much broader outlook because of the impact of Western life.

Nevertheless, the Risalpur cadets have a wide range of sports and extra-curricular activities, as is the case at Cranwell, and a glider unit has just arrived to provide soaring facilities in the standard P.A.F. selection of machines, including the Primary, Baby EoN, Sedbergh and Olympia. Auster 6s are being used for towing. Harvards are used on an all-through basis for pilot training, T-6Gs with modified cockpits and canopies having been received under the American aid programme. The flying syllabus includes a total of 20 hr. initial grading, 101 hr. general handling, 20 hr. instrument flying, 25 hr. navigation exercises, 22 hr. formation flying, 12 hr. night flying, and 10 hr. general exercises, comprising about 210 hr. in all. Ground officers also complete 5 hr. dual on air experience at Risalpur.

At the moment, the P.A.F. College has no large permanent buildings for its students and has to use hutted accommodation, like Cranwell after World War I. Plans are in hand, however, for an extensive building programme, which will be completed in a few years, but the instructional facilities are already first-class. Among the equipment we were shown was a small open supersonic wind tunnel, built by one of the instructors, with a M=1.4 outlet, using highly compressed air, and showing shock wave patterns on various bodies by the Schlieren method. There is also a reference library with 12,500 books, most of which are in English, the standard P.A.F. language, but there are also classical works in Urdu, Bengali and other Oriental languages. Every cadet who passes out from Risalpur begins his service on a 10-year commission basis, and permanent commissions are awarded to selected officers at a later date.

(To be concluded)

North-American T-6Gs, or modified Harvards, are used for pilot training by the P.A.F., at the Cadet College at Risalpur.

Commonwealth's Air Effort in the Antarctic

HIGHLIGHTED on January 6 when Sqn. Ldr. J. Lewis, A.F.C., piloted a de Havilland Otter on the first crossing of the Antarctic continent by a single-engined aircraft, Commonwealth air activities in Antarctica have been progressing in various rôles since 1954. During the past three years aircraft and men of the Royal Air Force, the Royal Australian Air Force and the Royal New Zealand Air Force have directly supported two major expeditions—the British Commonwealth Trans-Antarctic Expedition and the Australian National Antarctic Research Expedition—and given limited assistance to the British International Geophysical Year Expedition which is operating without aircraft.

The Trans-Antarctic Expedition, which is making the first surface crossing of the Antarctic continent from Shackleton Base on the Weddell Sea via the South Pole to the shore of the Ross Sea, is a joint effort of Great Britain and New Zealand and is separate from Britain's expedition for the I.G.Y. operating from a static base at Halley Bay. Made up of two contingents led by Dr. V. E. Fuchs and Sir Edmund Hillary respectively, the Expedition is supported by R.A.F. and R.N.Z.A.F. detachments operating a D.H. Beaver and Otter, and Auster Mk. 7s.

On the other side of the Antarctic continent and 1,800 miles from Shackleton base is the Australian National Antarctic Research Expedition's base of Mawson. From here the R.A.A.F. Antractic Flight operating Beavers and an Auster has been flying up to 500 miles inland on photo-mapping and depôt-laying sorties. In addition, the 1956 R.A.A.F. Flight built the first hangar in Antarctica.

The first plans for the Trans-Antarctic Expedition were laid in the summer of 1954 and Dr. Fuch's advance party, including the R.A.F. detachment equipped with two Auster Mk. 7s, left London in the M.V. "Theron" on November 14, 1955. Commanded by Sqn. Ldr. Lewis, the detachment consisted of Flt. Lt. G. M. Haslop, a New Zealander serving in the R.A.F., and two N.C.O.s, Flt. Sgt. P. B. Western, B.E.M., an aircraft fitter, and Sgt. E. Williams, a ground radio fitter. In addition, Sqn. Ldr. J. R. Claydon, R.N.Z.A.F., who is leading the New Zealand air unit with Sir Edmund Hillary's section, travelled with the R.A.F. party.

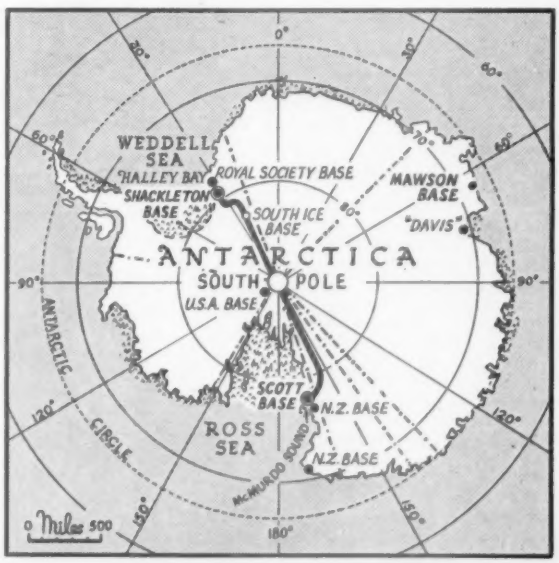
Both of the Auster Mk. 7s were modified to use floats or skis which fitted directly on to the normal axle in place of the main wheels, a small ski replacing the tail wheel. The floats, built by Austers, are of all-metal construction except for leather-covered pinewood nose blocks. Comprising a number of water-tight compartments fitted with inspection covers, each float has a retractable rudder.

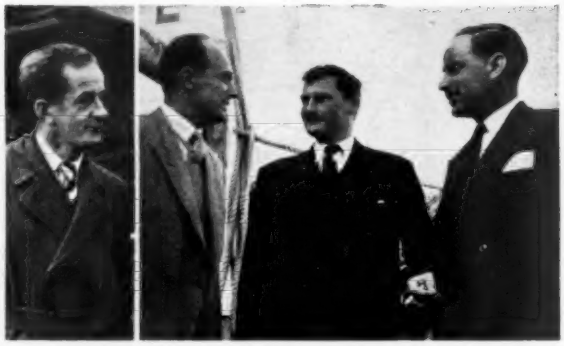
In addition to the undercarriage gear the main difference between these two aircraft and the standard Mk. 7 was in the fitting of larger vertical tail surfaces with aerodynamically balanced rudder and elevators. Fitted with D.H. Gipsy Major 7G engines, using Plessey cartridge starters, and driving Fairey fine-pitch metal propellers, the two Austers have oil dilution, engine priming and cabin and carburetter-heating equipment.

Radio equipment fitted in the cabin behind the observer's seat consists of a Marconi AD 97/108 HF transmitter/receiver and an AD.7092 radio compass. A drogue-type trailing aerial similar to that employed on the Auster A.O.P.9 serves the radio.

Arriving at South Georgia on December 16, 1955, the members of the expedition assembled one of the Austers and fitted the floats in preparation for the first task of guiding the "Theron" through the 800 miles of pack ice to Vahsel Bay. Within two days of leaving South Georgia on December 20 the vessel entered the ice floes in which it was to be locked for 23 days before a reconnaissance flight found a clear channel in the Weddell Sea.

This flight, an excellent example of the use of aircraft in such conditions, was made on January 20 by Sqn. Ldr. Claydon, who took the Auster off from a 350-yd. open stretch of water. Later, on January 27, when the "Theron" was near the British I.G.Y. Expedition's base at Halley Bay, four reconnaissance flights were made, unsuccessfully, to find a site for the start of





Members of the R.A.F. detachment with the Trans-Antarctic Expedition on board the M.V. "Theron," left to right, Sgt. E. Williams, radio fitter; Flt. Sgt. P. B. Western, aircraft fitter; Sqn. Ldr. J. Lewis, the C.O., and Flt. Lt. G. M. Haslop.

the trans-continental journey and Dr. Fuchs decided to press on to Vahsel Bay.

Two days later, Sqn. Ldr. Claydon flew the Master of the "Theron" towards Vahsel Bay and on the vessel's arrival Flt. Lt. Haslop made a reconnaissance with Dr. Fuchs which showed three possible landing sites and good access inland. The "Theron" tied up alongside the sea ice in position 76° 56′ South, 37° 16′ West, where the beach-head was established.

During this period, 15 hr. of ski-flying from sea-ice alongside the vessel was completed, the Auster behaving exceptionally well without any servicing difficulties. The aircrew clothing and other equipment used on these flights in temperature conditions of −2° F. also proved to be very satisfactory. After establishing Shackleton Base, the advance party returned in the "Theron" to London, where it arrived on March 23, 1956.

Before the main party of the Expedition sailed in the 1,600-ton motor ship "Magga Dan" from London on November 15, 1956, the R.A.F. detachment's new aircraft, the Otter, had to be flown to the United Kingdom from Canada. Piloted by Sqn. Ldr. Lewis, it was ferried from the Canadian de Havilland plant near Toronto to Hatfield via Goose Bay, Bluie West One, Kelflavic and Kinloss.

The Otter was fitted with a 180-gallon long-range tank before delivery (giving it a total capacity of 358 gal.) and on its arrival in England it had additional radio equipment installed, was "winterized," and crated aboard the "Magga Dan."

Crossing Antarctica

The Expedition arrived at South Georgia on December 17, where the wings were fitted to the Auster, which was then test flown in preparation for the flights in the Weddell Sea. By December 26 the "Magga Dan" was surrounded by heavy pack ice in a position 64° 02′ South, 31° 31′ West; four days later Sqn. Ldr. Lewis reported very difficult conditions at the east and south and the final attempt to get through the Halley Bay was made on January 4, 1957.

At Halley Bay the wings were fitted on the Otter, which was later test-flown in preparation for use on coastal and inland reconnaissance sorties. Its first important flight was the reconnaissance of the route along the coast to Shackleton Base from Halley Bay on January 10. This was followed by the first inland flights the next day and on the third of such sorties Flt. Lt. Haslop, accompanied by Dr. Fuchs and Mr. K. Blaiklock, a surveyor with the Expedition, flew 700 miles in 6¼ hr. and reached latitude 82° 15′ South.

By the beginning of February, 1957, all preliminary reconnaissance flights had been completed and the laying down of Depot 300 (the depot 300 miles south of Shackleton) was ready to start. Up to that time a total of 55 hr. flying had been logged by Sqn. Ldr. Lewis and Flt. Lt. Haslop in the two aircraft. The Otter, fitted with skis only, had been flown for 37 hr., and the Auster had completed 8 hr. using floats and 10 hr. with skis.

Between January and December, 1957, when a start was made on the main task of providing air support for the Expedition's ground party on its final four-months' push across the South Pole and ice cap, the R.A.F. detachment logged a total of 360 hr. flying. Maintenance, using standard R.A.F. equipment, went smoothly except for the longer time factor because of wind, snow and low temperatures.

Learning by experience, Flt. Sgt. Western and Sgt. Williams used the engine pre-heaters not only to warm-up engines but to prevent tools, such as hydraulic jacks, from freezing. After every refuelling up to a cupful of ice crystals had to be removed from fuel filters and a mobile refuelling rig was evolved using a pump mounted on a sledge. A "Snocat" vehicle transit case and a tent were adapted as a workshop.

In landings away from base, the Otter gave no trouble other than oil leaks, which were affects of the low temperatures on the rubber engine seals. Apart from one minor engine repair and repairs in the field to the tail ski and undercarriage damaged in take-off, the Auster had also been trouble-free up to the end of last year.

The outstanding feat by Sqn. Ldr. Lewis and the other three members of the R.A.F. detachment in making the first flight across the Antarctic continent in a single-engined aircraft came on January 6, 1958. Flying from South Ice to Scott Base by way of the South Pole, they took 10 hr. 57 min. for the 1,250-mile crossing.

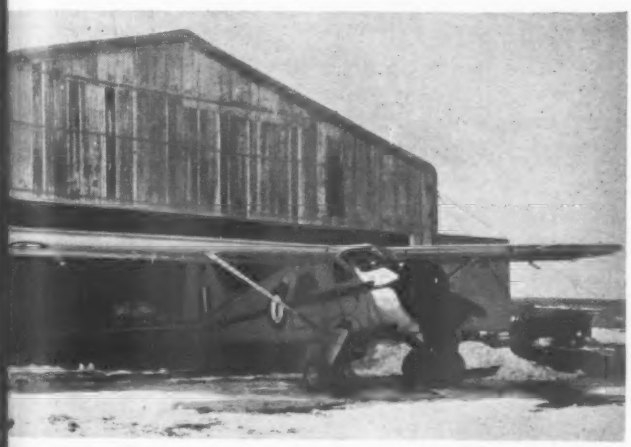
The R.N.Z.A.F. Antarctic Flight was formed on May 1, 1956. It is equipped with one Auster which can be operated on wheels, floats or skis, and one Beaver for wheel or ski flying. In addition to its leader, Sqn. Ldr. J. R. Claydon, who was seconded to the R.A.F. detachment with Dr. Fuchs' advance party during the winter of 1955-56, the R.N.Z.A.F. party consists of Flg. Off. W. J. Cranfield, the second pilot; Sgt. Tarr, engine fitter, and Cpl. P. H. Tate, radio fitter.

Its rôle with the New Zealand contingent was planned on similar lines to that of the R.A.F. detachment with Dr. Fuchs and covered the provision of ice reconnaissance and the location of a suitable route through the Ross Sea pack ice for the New Zealand expedition ship. Air reconnaissance of McMurdo Sound was made to locate a suitable area for the establishment of Scott Base and sledging routes over the Victoria glaciers.

The Beaver of the R.N.Z.A.F. Antarctic Flight (Sqn. Ldr. J. R. Claydon) at Depot 700 during the recent airlift of fresh supplies for Dr. Fuchs' party on the journey from South Pole to Scott Base.

The three types of aircraft—D.H. Beavers and Otters, and Auster Mk.7s—operated by the Commonwealth Air Forces have been modified to use floats or skis in addition to the standard landing gear. Details of the ski-wheel equipment for the Beaver can be seen on the right.

Below, a D.H. Beaver on the sea-ice outside the portable hangar erected by the 1956 R.A.A.F. Flight at the Australian National Antarctic Research Expedition's base at Mawson. The hangar was an important factor in keeping the aircraft serviceable throughout the winter.



Other duties undertaken by the Flight included the air supplying of depots which were established on the Polar Plateau between McMurdo Sound and the South Pole, photograph-reconnaissance liaison flights from Scott Base and the supplying of depôts set up by various New Zealand scientific and surveying parties.

Training by the Flight before its move to the Antarctic with the Expedition was undertaken in the Mount Cook area of New Zealand. There in the winter and spring of 1956 it operated from glacier bases under low-temperature conditions on air-to-ground co-operation and supply-dropping missions. Also, during this period Polar navigation techniques were practised and the members of the Flight had instruction in mountaineering, cold-weather survival and ski-ing.

The Flight left Wellington for the Antarctic in December, 1956, and is still operating with Sir Edmund Hillary's party.

R.A.A.F. Antarctic Flying

Since the first R.A.A.F. Flight went to the Antarctic as part of the Australian National Antarctic Research Expedition (ANARE) in 1954, the R.A.A.F. pilots flying from the base at Mawson have logged approximately 1,500 hr. without a single accident. Operating two Beavers and an Auster owned by ANARE, the Flight is now permanently stationed in Antarctica on a yearly basis.

The routine for sending R.A.A.F. personnel to the Flight is now well established and draws on volunteers. A fresh party of six, three pilots and three ground crew, goes to Mawson each January to relieve the party which has wintered there, taking with it a Beaver to replace one of the two at the base. The two pilots for the following year also go to Mawson to learn about the local conditions and then return to Australia with the third Beaver to train and prepare the next Flight.

The 1954 and 1956 Flights (there was no Flight in the Antarctic area during 1955) were led by Sqn. Ldr. D. Leckie, O.B.E., A.F.C., who has probably flown more hours in the Antarctic than any other pilot. The 1957 Flight, which was returning from Mawson last month, has been led by Sqn. Ldr. P. Clemence, a former flight commander of No. 77 Squadron, and during its tour logged over 500 hr. flying.

Describing the work and flying experiences of the 1956 Flight, which was the first R.A.A.F. party to winter on the Antarctic continent and the first expedition to erect a hangar, Sqn. Ldr. Leckie has given some interesting facts on the problems involved in operations where ground temperatures are −20° F. with a 5° inversion near the ground and another at about 6,000 ft. Arriving at Mawson on February 17, 1956, the Flight spent the first two months erecting the hangar, which was to be an important factor in keeping the aircraft serviceable until the harbour ice broke up the following December.

Its main task is to assist the ANARE by flying personnel, equipment and stores for the various scientific investigations in the area. In addition, the 1957 Flight opened and operated throughout the past winter a regular air service between Mawson and the new Australian base at "Davis," 450 miles away. The Otters are also used to reconnoitre the coast for the ANARE relief ship and make photograph-mapping sorties. At the end of the year, Sqn. Ldr. Leckie and his two pilots had flown 600 hr. on exploratory photographic and depôt-laying flights, of which only 40 hr. could be said to be wasted, mainly because of bad weather. In all 27 tri-metrogon photographic runs (the Beavers are fitted with tri-metrogon K 17 cameras) covering an area of about 350,000 square miles were made and approximately 1,200 miles of coastline were photographed.

Polar navigation techniques were used on practically all flights, the grid being based on the Greenwich meridian. The gyro function of the polar-path compass was used for heading and checked regularly by astro compass headings. The drift recorder and the radar altimeter were used to assist navigation. To get a true heading either on the ground or in the air at Mawson, the polar-path compass was set on "slave" and, using local magnetic variation, computed the true heading to set on the normal gyro. The polar-path compass was then switched to "gyro," and the true heading from the D.G. applied to it. This heading was checked as soon as possible after take-off by astro-compass.

All local maps of the area were reasonably accurate, and map reading along the coast presented no problems. Pilot-navigation techniques were all that was required. Inland all navigational aids were required to maintain an accurate air plot. This was kept by whichever scientist was acting as crew member, who made use of the astro-compass, drift sight and radar altimeter.

The radio compass was sensitive at close range and indicated overhead promptly. However, 30 or 40 miles from the base the wander rate was bad, though this was only to be expected from the low-powered transmitter in use. On all major flights the Auster, on standby for search and rescue, maintained an air-borne link between the Beaver and base to extend the range of communications.

Airframe icing is an ever present problem in the Antarctic where the temperature rarely rises above that of salt-water freezing, 28° F. Elevator trim tabs freeze easily with salt-water spray, and on one occasion in 1955 Sqn. Ldr. Leckie had to abandon a take-off because so much ice had collected on the airframe and floats—the floats were almost awash. De-icer fluid on these occasions is almost useless.—P.R.R.

Sir Robert Saundby

The R.A.F. and the White Papers

FOR the past 12 years the nuclear power of the West has kept the peace in Europe, and though East and West are now approaching nuclear parity there is no reason why the balancing fears of mutual annihilation should not indefinitely prevent the outbreak of a World war. Since our share of this deterrent, according to the White Paper "Report on Defence" (Cmnd. 363), published on February 13, represents less than 10% of our total defence expenditure, it might have been thought that this was a small price to pay for the avoidance of a conflict which, whatever the weapons employed, could not fail to bring immense destruction and loss of life and, as far as we are concerned, complete economic ruin.

There is, however, a widespread feeling—one cannot call it a school of thought—that Western nuclear power has had no deterrent effect, and that a major war has not occurred simply because the Communists have no intention of using force to achieve their aim, often reaffirmed and never denied, of achieving World domination. Others claim that, if the Soviet Union is deterred from using its nuclear weapons by Western nuclear strength, so also are we deterred from using ours by Soviet possession of them. Since neither side would dare to use them, in any circumstances, we are urged to stop wasting money on them and to devote all our resources to the building up of conventional forces. And some of those who admit that Western nuclear power has had a deterrent effect advocate that we should shelter under the shield of the United States deterrent, and make no contribution towards it ourselves. They believe that we should devote all our defence effort to an attempt to build up forces capable, if necessary, of meeting full-scale Soviet aggression without resorting to the use of nuclear weapons. Indeed, from the arguments of some people, it seems that they believe that our incapacity to retaliate would deter an enemy from attacking us.

It is satisfactory to see that the White Paper makes no concessions to these dangerous and impractical ideas. While it admits that the Western defence system has rested primarily on the strength and readiness of the American Strategic Air Command, it emphasizes that Britain is making an increasingly significant contribution to the Western nuclear deterrent, by means of V-bombers carrying our new megaton bombs.

Measures are also being taken to reduce the vulnerability of the deterrent. Fighter Command, to be reinforced and in time largely replaced by ground-to-air guided missiles, has the task of protecting the bomber bases—which must, incidentally, provide a fair measure of protection for the country as a whole. The cost of the fighter force, the control and warning system, together with research and development on fighters and defensive guided missiles, amounts to less than one-tenth of our whole defence expenditure. The state of readiness of the bomber force is being raised, so that the bombers may be able to take-off before an attack could be delivered.

Our Right To Decide

The case for Britain's contribution of its proper share towards the nuclear deterrent was very well put by the military correspondent of *The Sunday Times* on February 16. He pointed out that if we do not play our part in maintaining the balance of nuclear power we cannot claim any share in decisions as to its use. Only if we participate can we have the right to claim a voice in its control. And it is quite illusory to suppose that, as a member of NATO, we could avoid the consequences if the U.S. were to resort to nuclear warfare.

Our participation, therefore, in the Western nuclear deterrent not only adds substantially to the effectiveness of that deterrent, but gives us a voice as to how, and when, it should be used. And these immense advantages, and the whole of our air defence system, cost us less than 20% of our total defence expenditure.

The White Paper gives no encouragement to those who believe that, if we ceased to provide our share of the nuclear deterrent, we could build up conventional forces capable of meeting a full-scale Russian attack. On the contrary, it says that it must be well understood that, if Russia were to launch a major attack on the Western nations, even with conventional forces only, they would have to hit back with strategic nuclear weapons. It goes on to say that these stark facts should be stated plainly. Indeed, it is absurd to imagine that NATO, which at present has at its disposal some 30 divisions and is never likely to have more than 40, could hope to match the 200 divisions of the Communist bloc.

The people of this country have not yet realized that if they give up nuclear weapons, even if the Communists gave them up also, they must accept conscription permanently, and even then there would be no possibility of saving Europe or ourselves if the Soviet Union should decide to march westwards. Though it is, like so much else, a choice of undesirables, the right decision should not be difficult to make if the facts are faced.

The White Paper hopes that it may be possible to bring about disarmament in stages, but it points out that "if the safety of humanity is not to be imperilled, great care must be taken to maintain, at each successive stage, the balance of military power and deterrents which, for the present, constitute almost the sole safeguard of peace." This vital point is often forgotten by those who, ignoring our disappointing experiences between the two World Wars, believe that unilateral disarmament on our part, by setting a good example, will bring about a general reduction of military forces. There is not the slightest prospect of its doing so. Nothing, in fact, would be more likely to encourage the Soviet Union to resort to military aggression, and nothing could do more to ensure that it would be successful.

For the future, an agreement has been reached with the United States for the provision of launching sites in this country for Thor intermediate-range ballistic missiles. The weapons, which will be provided by the Americans, will be operated by Bomber Command from sites in eastern England, though the war-heads will, for the time being, be held in American custody.

In addition, it is announced that we are concentrating on the development, on the highest priority, of a long-range ballistic missile of a more advanced type, designed for launching from underground. Both these projects, which are essential to our security, have been criticized by those who believe that we are less likely to be attacked if we possess no modern weapons, and are unable to reply to a nuclear assault.

Too Slow Commando Force

The Navy's task, in limited war, is to protect our sea communications, escort troops and supplies to the scene of action, and give support to land forces. In global war, it is to make an effective contribution to the combined Naval forces of the Western Alliance, a statement which does not give much indication as to the kind of task for which they would be needed.

A carrier will be converted to accommodate a Marine Commando force and will be equipped with helicopters. While this may be valuable on occasions, it is very slow and the force that can be deployed is negligible compared to a properly organized system of air transport.

The Navy has been given authority to recruit to a ceiling of 88,000 men, the Army to 165,000, and the Air Force to 135,000. From this a rough idea of the scope of their ultimate responsibilities can be deduced.

The Memorandum by the Secretary of State accompanying the Air Estimates, 1958/59 (Cmnd. 373) provides for a gross expenditure of just over £506 million. The cost of pay and allowances is up on last year, owing to the recent improvements in Service pay and conditions, and the special compensation paid to those prematurely retired or discharged.

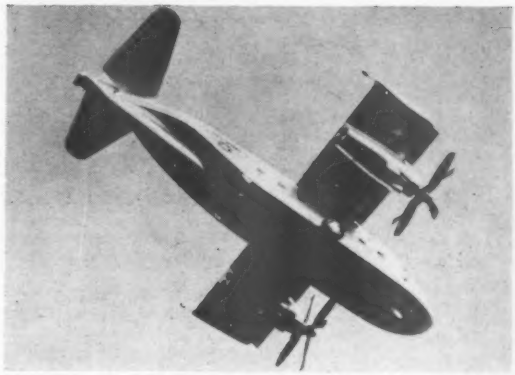
The aim is to have an all-regular long-service Air Force by 1962 of a size and quality that will enable it to perform three main tasks: to provide our share of the nuclear deterrent and defend it, to play its part in fulfilling our international treaty obligations, and to support our colonial and overseas policies.

The Mark 2 Victors and Vulcans have been ordered, and are to be equipped for flight refuelling. Some increase in Transport Command is planned, but in my view it is far from being adequate. We do not yet seem to have realized how great an increase is needed if the Central Reserve is to be genuinely mobile and effective.

The future of the Air Force is now critically dependent on its ability to recruit sufficient long-service officers and airmen of the right quality. So far, the recruiting figures are reasonably encouraging, and are sufficient to maintain a force of the size visualized for 1962, but not to build it up quickly enough. It is to be hoped that the new conditions of service will stimulate a marked improvement; the Air Training Corps is providing a large proportion of the new recruits.

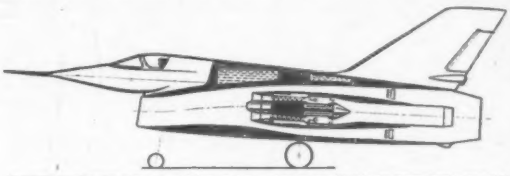
The Air Force cannot afford to allow its recruiting policy to fail. There is, at present, intense competition among the three Services, faced with the largest pruning knife they have seen for a long time, to take over many of the new functions associated with ballistic and guided missiles. Nothing could do more to prejudice the future of the R.A.F. than an inability to undertake its proper responsibilities for lack of manpower.

NEWS IN PICTURES



Howard Levy photograph

Above, a model of the Hiller X-18 pivot-wing aircraft, development of which is being conducted by the Air Research and Development Command, U.S.A.F. The diagram (below) shows the 8,160-lb. thrust S.N.E.C.M.A. Atar 101 E4 turbojet in the Nord 1500-02 Griffon, which has attained M=1.85. The powerplant is mounted in a duct so that, at high speeds, air passing around the turbojet has fuel mixed with it and burnt to work as a ramjet.



In the picture on the right Armstrong Whitworth's chief test pilot, Mr. Eric Franklin, hands over the first Sea Hawk Mk. 100 of a batch ordered by the West German Navy. On the left is Lieut. Cdr. Franz, German Naval Air Arm; on the right is Cdr. G. R. Callingham, Commander (Air) of R.N.A.S. Lossiemouth.

Above, Mr. Aubrey Jones, M.P., Minister of Supply (right) visited the aircraft division of the English Electric Co. Ltd., at Preston on February 21 and saw development and production of the P.1 and Canberra aircraft. With him here, from left to right, are Mr. J. H. McDonnell, chief programmer; Mr. F. W. Page, chief engineer, and Mr. W. S. Coulshed, chief electronics engineer.

Above is an impression of the twin-jet Méditerranée designed by the Marcel Dassault company for executive duties.

Britain's first static test site (right) for missiles of up to ICBM size at Spadeadam Waste, Cumberland. This will be used for the ground firing of rocket engines installed in the missiles concerned. For the past 14 months about 800 workmen have been engaged in its preparation. This picture shows the cable duct tunnel of reinforced concrete being built. The test control building is in the background.

From the Lecture Room

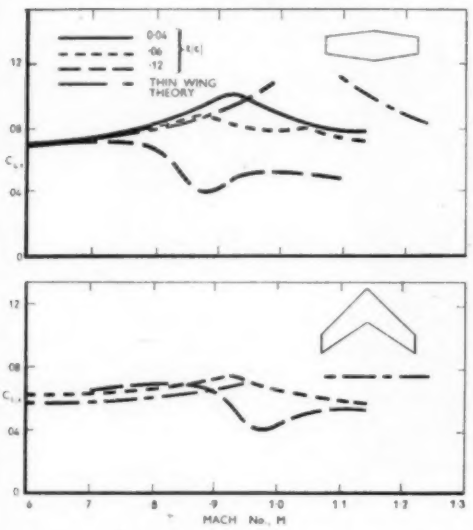
The Rôle of Research

Mr. Axel T. Mattson.
Photograph copyright "The Aeroplane"

IN THE WHOLE field of aeronautical research no institution is better known than the National Advisory Committee for Aeronautics (NACA) in America. It was with particular interest, then, that we attended the lecture given by Mr. Axel T. Mattson on "The Rôle of Aeronautical Research in the Design of Airplanes" at the Training Center for Experimental Aerodynamics (TCEA), Rhode Saint-Genèse, Brussels, on February 20.

As was the case with the previous guest lecturer at the TCEA (THE AEROPLANE, January 31), the subject was dealt with in two parts. The first session covered research problems and programmes; the second was largely concerned with stability, flutter and buffeting.

Mr. Mattson introduced his subject by emphasizing the importance of understanding the techniques of measurement in all fields. Basic research and development research is essential, he said, but



Effect of wing thickness/chord ratio on lift-curve slope.

directed research is the most important of all in that it is related to actual hardware being built. It is erroneous to think that all frontiers are boundless and relate only to the amount of money spent. Some boundaries and limits must be recognized or a lot of money is wasted by misdirected efforts. Research is complicated by the variation of inter-related parameters.

Aircraft handling at all speeds is of very great importance for transonic and supersonic transports, particularly for commercial types where no leeway can be allowed. Requirements for stability in transonic flight are still being considered. Very important is the understanding of fundamental phenomena.

Flow patterns over wings can be dominated by the sweep, high taper and low aspect ratio. Tip effects depend on taper, and tip distortions of flow will influence a large portion of a low aspect-ratio wing. The vortex lines of a swept wing separate from the leading edge near the apex and follow the leading-edge angle, turning downstream at the tip and increasing in strength.

Vortex separation presents a serious departure from the considerations used in potential-flow theory. Therefore the use of calculations based upon this theory are practically limited to zero angle of attack. However, the understanding of this phenomenon from experimental evidence led Michael and Brown to treat the separated flow case and obtain a potential-flow solution for triangular wings, on the basis of slender-body theory.

They assumed the flow to separate tangentially to the wing leading edge, and that a feeding vortex sheet existed between the wing and the concentrated vortex. The results predicted an increase in lift and experiments have given a qualitative verification. Vortex separation strongly influences stability derivatives and can also affect the dynamic characteristics by a time-lag in establishment (hysteresis effect).

An excellent example of directed research is the investigation of wing-body interference which culminated in the discovery of the Area-rule concept by Dr. R. T. Whitcomb (THE AEROPLANE, January 31). This was the direct result of much experimental research into interference effects which included the use of transonic wind-tunnels and experiments with wool-tufted models, probes in space, pressure-distribution measurement and Schlieren flow-visualization. Analysis of this work gave an understanding of the phenomena involved and the results were quickly applied.

A technique philosophy that has been highly successful is the interchange of models and balances, including the sting support, from transonic to supersonic tunnels. At the Langley Aeronautical Laboratory, complete wind-tunnel programmes on a specific aircraft design can be performed with the same model in the 7-ft. by 10-ft. high-speed tunnel, the 8-ft. transonic and the 4-ft. supersonic tunnels.

It is usually possible to define the scope of research required and it is important to reduce the time taken before it is applied. For these reasons the manufacturers and the researchers must co-operate and the various research facilities must avoid duplication of effort. It must be known how to define important variables and how to measure them.

Frequent evaluation of data is essential because off-shoots of information are often of great importance and provide real keys to fields of new study. Thus it is important not always to carry out a pre-determined programme to the very letter. It is far better to follow up the results obtained day by day so that the nature of the phenomena is understood and it becomes evident where further study is needed.

Little data is yet available on the drag of transonic aircraft. More work must be done on this with wind-tunnels and rocket models. It is not doubted that wind-tunnels give directly applicable drag results, but only if the skin-friction drag can be separated.

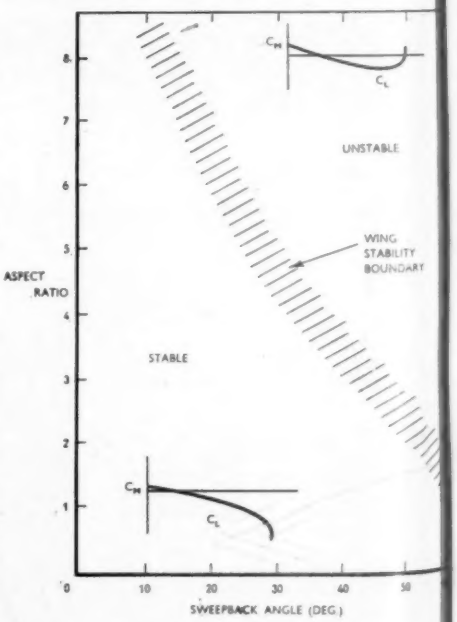
Models are often too small relative to the displacement thickness of the boundary layer which may be of the same order as the thickness dimensions of the model, variation of displacement thickness thus amounting to a variation of thickness ratio. So although the wave-drag problem has been solved the estimation of skin-friction drag is difficult.

Constant research is made on the installation of propulsion systems—the inlet, engine and exhaust being considered as separate elements. The basic requirement of an inlet at transonic and low supersonic speeds is high pressure-recovery and a good flow-distribution at the engine for a wide range of engine operating conditions.

A high value of thrust-minus-drag is a compromise between good internal pressure-recovery and a reduction of external drag. As much as 1.5% increase in thrust may result from an intake recovery increase of only 1%. Even if externally increased drag is raised by 1% to get 1% increase in pressure recovery, the net thrust increase will still be 0.5% of thrust-minus-drag.

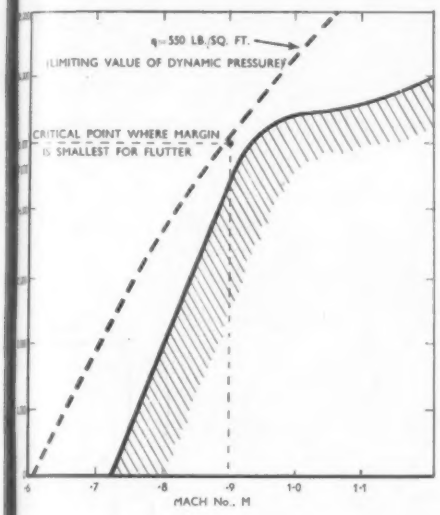
Stability and Control

Modern trends in the development of aircraft and missiles have radically affected the analysis of wind-tunnel experiments and also flight testing with



Planform (aspect ratio and sweep) has a primary effect on the wing stability boundary.

regard to stability and control. In the past, wind-tunnel and flight test analyses were concentrated on the performance and static stability characteristics. Today the modern aircraft depends not only on setting certain static stability and performance characteristics, but also on its possessing suitable dynamic properties. As a result, increasing emphasis is being put on experimental and analytical stability analysis in providing experimental



Critical flutter conditions usually appear in the transonic range where analytical methods are of the least use.

techniques and the use of digital and analogue computing equipment.

The modern trend in aircraft is the utilization of automatically controlled equipment and feed-back systems for the human pilot to augment the damping oscillations about one or more of the principal axes of the aircraft.

Aerodynamically, the modern aircraft is involved with many configurations having such features as sweepback, low aspect ratio, thin wings and slender fuselages. Most of these configurations suffer from non-linear aerodynamic effects. Problems of separated flow and its consequences have plagued aeroplane designers for years. The current trend in design has aggravated problems of separated flow.

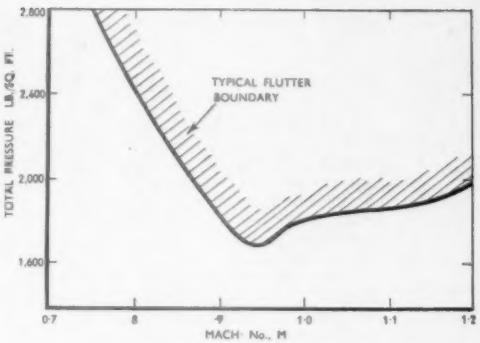
Analytical evaluation of the stability derivatives generally involves potential-flow solutions representing the wing by a vortex sheet, doublets or sources. The derivatives are obtained by integrations of the resultant forces. The same considerations can be given to the flow fields away from the wing and thereby one can derive the effect of the wing on other components. This would be fine were it not for the boundary layer which violates the basic assumptions.

Separation of the turbulent layer for thick wings and laminar separation for thin wings near the leading edge are common. At high speeds, shock-induced separation occurs and the shock moves rearward with further increase of speed, leading-edge suction disappears and as a result the stability derivatives are critically dependent on Mach number.

Lecture Discussion

Asked by CAPT. E. G. SHARKOFF (AGARD) about the techniques required for combating thermal problems, Mr. Mattson said that the know-how for simulation of flight at hypersonic speeds was available. Temperature-flow theory was being widely considered, but better materials would be preferable to temperature problems.

PROF. F. HAUS (Universities of Liège and Ghent) asked the size of model air



A typical wind-tunnel flutter boundary.

intakes and was told that these were usually of about 2 sq. in. because the shock-wave reflection problem limited model size and the Reynolds number to about 2.5×10^6 at $M = 1.0$.

To the inquiry of PROF. B. FRAYES DE VEUBEKE (University of Liège) about the physical similarities between models with full-scale practice, the lecturer replied that all aeroelastic properties should be simulated, but that this had not yet been done.

MR. S. STAPLETON (Folland Aircraft, Ltd.) wanted to know if control surface "buzz" could be simulated. Mr. Mattson said that this was difficult, but good correlation of model and full-scale results might be obtained by using a tunnel filled with Freon gas. The 19-ft. NACA tunnel was being converted for this type of work.

Mr. Mattson told IR. H. WITTENBERG (Technische Hogeschool Delft) that it was not yet possible to measure all combinations of stability parameters in a wind-tunnel; components were isolated and later integrated.

Rocket Propulsion Explained

A LARGE number of aeronautical rocket engineers helped to fill to capacity the lecture hall of the Royal Society of Arts on February 19 when Mr. J. E. P. Dunning, M.A., F.R.Ae.S., chief superintendent of the Rocket Propulsion Department of R.A.E. at Westcott discussed the currently important subject of rocket propulsion. Among the distinguished audience we saw Dr. G. W. H. Gardner, Director of the R.A.E., and Mr. E. T. Jones, Director General of Technical Development (Air) at the Ministry of Supply and many other well-known "rocketeers."

Describing rocket propulsion as the most vivid tangible expression of Newton's Laws of Motion, Mr. Dunning decided in his lecture to deal with the basic principles of his subject. In doing this he has provided a most useful paper, which for the uninitiated will serve as an excellent "primer" in rocket engineering. And to make the discourse doubly useful the printed version will include an appendix which gives the derivation of the mathematics used in the body of the text.

So far as the spoken lecture was concerned, the author gave a masterly "off the cuff" summary of his paper. This he demonstrated with the aid of a balloon and some simple mathematics on the blackboard. After dealing with the first principles of rockets, he went on to talk about the more practical aspects of propellents (this part of his lecture was summarized in THE AEROPLANE for February 21) and the final sections of his paper concerned the basic mechanics of the rocket engine.

Questions after the lecture ranged over many aspects of the subject. Many of them, however, dealt with the propellent problem. One speaker, for example, wanted to know more about the use of boron hydride fuel for rockets, but could be given no answer because of Security. Another wondered whether Mr. Dunning had not understated the case for solid propellents and another asked whether developments of current chemical fuels would be usable in interplanetary travel.

Whether it was better to have a large number of small engines or a small number of large ones, was another topic for discussion. On this score Mr. Dunning felt that so far as reliability was concerned the dice were loaded in favour of the smaller engines because these would have had a much longer development time.

Aeronautical Education at R.A.E.

A SUCCESSFUL year for the R.A.E.'s Technical College was reported by the Principal, Mr. R. D. Peggs, O.B.E., M.A., M.I.Mech.E., F.R.Ae.S., at the annual distribution of prizes on February 21. The past twelve months at the College, he said, had not contained any spectacular highlights but had been characterized by careful and solid consolidation of existing courses. An electronics course that had been designed by the College in conjunction with the City and Guilds Institute "to meet the domestic requirements of the R.A.E." had reached its fruition during the year. In this connection it is interesting to note that Mullard, Ltd., have presented two prizes to be awarded annually to students of electronics.

Mr. Peggs went on to say that another new course that had been developed, for design engineers, was now firmly established and 20 candidates had passed the National Certificate examination arranged for them. He emphasized the importance that the College attached to the training of design engineers.

A modification to the R.A.E. courses for Scientific Assistants had been made possible by the opening of the new Farnborough Technical College. In future, following their full-time induction course at R.A.E. most of these students would now proceed to a Higher National course in applied physics in the Farnborough college. Courses would be developed in this field.

G.P.I. by Bell Punch

ACCURACY in completely airborne navigational equipment is a primary requirement since aircraft with this apparatus may be expected to fly over areas not equipped with ground aids. At each stage of position resolution, considerable design effort is turned towards the reduction of error, and it is of paramount importance that the final presentation derived from various inputs shall be computed accurately.

The advantages of using the Doppler system in modern high-speed aircraft have been described, and considerable interest centres in the Ground Position Indicators Marks 4 and 4A*, which were designed by the Bell Punch Co., Ltd., in conjunction with the R.A.F. This instrument is the most advanced and accurate in the series of air navigation equipment, the design and manufacture of which has been a speciality of the Bell Punch Co., Ltd., since 1940.

These latest instruments have been in quantity production since 1954 for the Royal Air Force and Commonwealth Air Forces.

The information automatically and continuously available to the navigator using a Bell Punch Ground Position Indicator, is in one of three forms: —

(i) Ground mileage presented as N-S and E-W components. The counters show nautical miles from zero starting point, and register up to 4,000 miles each.

(ii) Mileage along and across a track manually set by knob and drum marked in degrees. The N-S counter shows miles gone along the chosen track, and the E-W counter shows miles off track to the left or right.

(iii) Aircraft position in terms of latitude and longitude expressed in degrees and minutes.

Choice of presentation is made by the navigator before take-off, by means of a three-position lever on the front of the instrument.

The Indicator is supplied from the separate Doppler equipment with ground speed by electrical transmission to a repeater motor, and drift angle by synchronous transmission to a servo system within the instrument. The drift servo system includes an amplifier which is external to the indicating instrument.

True heading is supplied from a compass master indicator to a repeater motor.

* See THE AEROPLANE, July 19, 1957, p. 89.

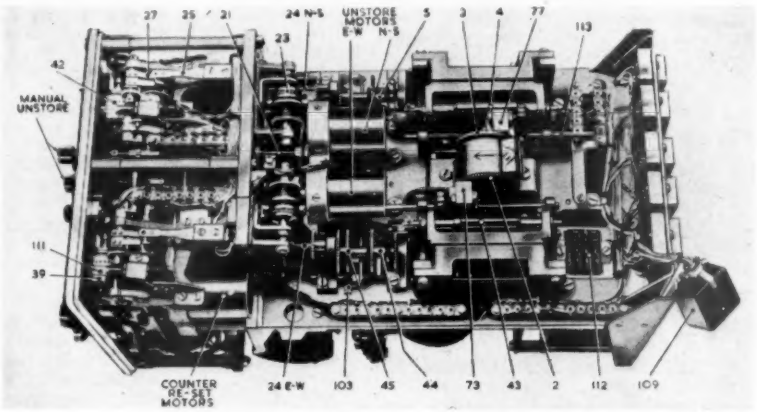
The instrument is primarily of a mechanical nature and employs three resolving mechanisms, consisting of disc-ball-roller assemblies.

Two of the resolving mechanisms are driven simultaneously by gearing from the ground speed repeater motor. By arranging the motor to drive the discs at a speed relative to ground speed and positioning the take-off balls by related cranks set at 90° to each other, the rotation of one ball is at a maximum when the other is stationary and the ratios of rotation for any other position vary as the sine and cosine of the angle at which the crank group of the equipment is set.

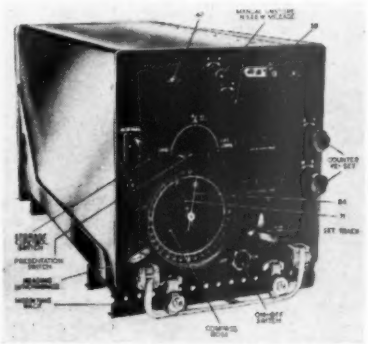
As the crank angle is set by the track the balls will revolve at a speed proportional to the N-S or E-W component of the ground speed respectively. The balls drive rollers which are connected to the visible counter.

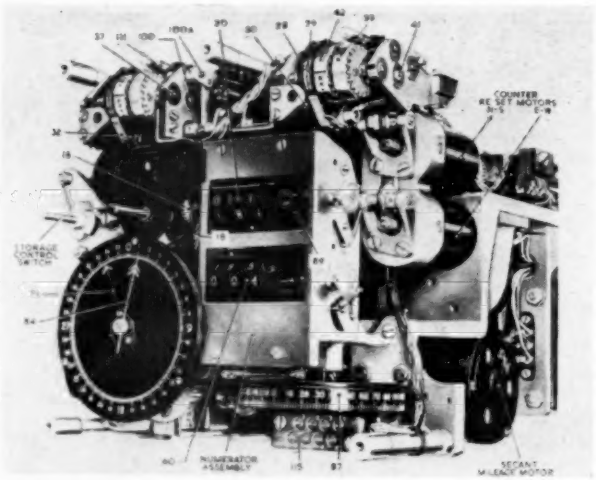
Such an arrangement is used for components in nautical miles or along and across track resolution. To provide the third alternative presentation, i.e., latitude and longitude, it is necessary to introduce a variable ratio to compensate for the converging meridians as latitude increases. As this ratio varies as the secant of the latitude, the third resolving gear is used but in the opposite sense, i.e., the E-W miles input is applied to the roller and the balls are positioned at an angle corresponding to the latitude which provides a drive to the disc proportional to the secant of that angle.

The inclusion of this resolving process is automatically provided with the selection of "GRID," i.e., lat.-long. presentation by the three-position lever.



Right, this Crown copyright photograph reproduced by H.M. Stationery Office permission shows the G.P.I. Mk. 4A. Above, view of top of mechanism showing N-S and E-W resolving units (output rollers 4 and 43 resp.).





Left, view of front mechanism with front plate removed, showing numerator assembly, heading pointer 71, track pointer 84, set track drum 87. Storage units are discernible.

The counters which receive the resolved outputs are mounted in one frame, the upper row of figure drums displaying N-S or distance made good along set track, and the lower row E-W or distance L or R of set track. The counter, although of apparently conventional design using mutilated pinion transfer from units to tens, etc., incorporates a novel and valuable feature which eliminates the fault hitherto inherent in single drum counters of losing a mile when crossing the equator or zero meridian.

Previously, it had been found necessary to use four separate rows of drums for N, S, W, and E, as in the counter designed by the Bell Punch Co., Ltd., in their Air Position Indicator Mark I, designed in 1940 and manufactured in large quantities since. (A lightened version of the same counter is in current manufacture by Messrs. Rose Bros., Gainsborough). These counters have

also been supplied to a number of other companies for various duties.

The new design results in a saving of nearly 50% space and weight.

The method adopted in the present counter to eliminate the "lost" mile comprises an auxiliary carriage in which the transfer pinions are mounted. This carriage is stationary during the whole time the counter is in use except when passing through zero when the carriage is caused to move with a sliding shutter to display the new reading. The pinion carriage is controlled to move at zero and at no other time, by the coincidence of two holes in two separate 20- and 21-tooth gears driven by the input to the counter.

For operational purposes it may be necessary to check and amend the counter readings over a fixed point. To store the input whilst a "fix" is being made, without disturbing the reading standing in the counter at the time of starting the check, two storage devices are provided, one for N-S and the other E-W. Although of counter construction, the drums of these devices are not figures but engraved to indicate the presence or otherwise of a quantity in the store.

When the adjustment has been made to the main counter, either by motor or hand resetting gear, in accordance with the information obtained during the fix, then the stored mileage is fed into the counter concurrently with the normal input. The action is entirely automatic upon being initiated by a two-position—"Normal-Fix" lever.

Means are also provided in the form of electrical stepping transmitters to pass on ground position components and track.

Ranges:

Ground speed ..	0-800 knots
Drift (Mk. 4) ..	±20°
(Mk. 4A)..	±35°
Track rate.. ..	720° per min. (max.)
Counters:	
Grid A/A track ..	4,000 nautical miles
Lat. long.. ..	±400° longitude ±70° latitude
Storage	160 nautical miles on each component
Weight:	
G.P.I. Mk. 4 or 4A and Amplifier	31 lb. (approx.)

The input of information for ground speed and drift is provided by Marconi Wireless Telegraph Co., Ltd.'s equipment, using the Doppler effect, and the synchronous servo unit and amplifier by Kelvin and Hughes Co., Ltd.

Avro 504 Club Dinner

THAT "Aviation keeps you young" is never more clearly demonstrable than at the Avro 504 Club's annual dinners at Londonderry House. This year the inspired and charming man who started it all was for the first time not among the 30 of his original apprentices, but one of them, SIR ROY DOBSON, voiced their sentiment when he said "For me, 'A.V.' will never be dead." He spoke of the pioneer's inventive genius and persistence before he turned to the prospects of the company which bears the great man's name.

This country, he said, should be working with powerful Government backing on an airliner or bomber capable of Mach 2.5-3.0; we could launch an earth satellite from a Vulcan at, say, 55,000 ft., eliminating the first stages of rocketry. The activities of the Hawker Siddeley Group and its associated companies in Canada and Australia were 70% industrial, 30% aeronautical but, said Sir Roy, "Without aviation I should just fade out."

GEOFFREY VERDON-ROE spoke of his father's great regard for the 504 Club and then quoted from a brochure called "The Aviator's Storehouse" put out by "A.V." in 1910. Among the items for sale was a "Triplane without engine, propeller, etc.—£275." It had "Tail well apart from mainplane, alighting on combined wheels and tailskid; span 20 to 26 ft., as ordered by customer" whose requirement was presumably guided by the size of his "shed."

Among other speakers were J. W. Ratcliffe, now of Handley Page, Keith Davies, who built and test-flew 50 Avro 504s in the '14-'18 War, G. W. Halse, who had helped "A.V." build his triplane in 1908, and P. Norris, who as a boy had been the first passenger in, or on it.

The Avro 504 Club Trophy was presented to the A. V. Roe company's best 1957 apprentice, William R. Chadwick (not related to the late Roy Chadwick. Avro designer), who thus becomes the sixth young apprentice member among those annually inducted into the Club. Finally, Joe Taylor, hon. sec., presented each member with a beautiful model of the 504K on behalf of the British Petroleum Company.—WREN.

Southampton U.A.S. Dinner

CONTINUED existence was the principal topic at the annual dinner of Southampton University Air Squadron on February 28, held as before at Air Service Training, Hamble. The C.O., SQN. LDR. T. H. J. BENTLEY, referred to the cloud which had hung over the University Air Squadrons a year ago when it was possible that the axe would descend as it had on the R.Aux.A.F. squadrons.

There were now to be at least four more annual dinners, although the squadron's General Duties flight establishment had been reduced from about 60 to 40. The squadron had had a reasonably good year and recruitment was encouraging. Speaking on behalf of the guests, MR. D. G. JAMES, M.A., Vice-Chancellor of Southampton University, once again (this was the sixth annual occasion on which he had made the response) gave a classical example of gracious speaking.

Proposing the toast of the squadron, AIR VICE-MARSHAL CORBALLY, C.B.E., A.O.C. of No. 61 (Southern) Group, assured the squadron of at least five years' existence and commended it for having a flourishing technical flight. Five ex-members had recently been granted permanent R.A.F. commissions.

The "Mr. Vice" this year, ACTING PLT. OFF. J. E. WILLIAMS, was also the winner of the Petter Trophy for aerobatics. The Bendall Trophy was presented to the best first-year cadet, Cadet Plt. Off. D. F. Abell, and Officer Cadet J. P. R. Browne was awarded the Livesey Trophy as best Technical Flight Cadet.

The Aerodrome Owners' Dinner

UNDER Charles M. Newton of Sywell, chairman for the sixth time in the Aerodrome Owners' Association's 24 years' existence, the A.O.A. held its annual dinner in London on February 27. There was some plain speaking.

After SIR GIBSON GRAHAM, Air Transport Advisory Council, had spoken apparently brieflessly, MR. AIREY NEAVE, Joint Parly. Secretary, M.T.C.A., recalled his Minister's recent appeal for more municipalities to operate their own airports. Mr. Newton later took up this point, asking for more Government help, perhaps along the lines adopted in America where the Government pays for the runways and services, the municipality paying for the airport buildings.

Gatwick Airport, said Mr. Neave, would be opened by the Queen on June 9 and would incorporate an integrated transport system and the Orly (Paris) baggage handling methods. London Airport's central area building for the long-haul operators was coming along and the Airport-London transport question, including the monorailway, was being examined. The 180 airfields now available for civil flying included 60 R.A.F. airfields.

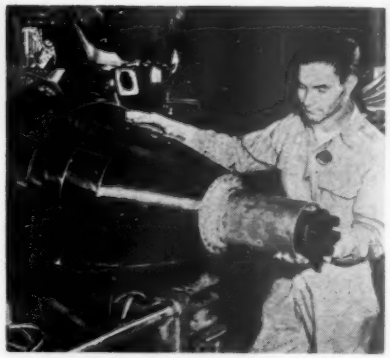
SIR FREDERICK HANDLEY PAGE spoke as a guest who owned a free-for-all aerodrome and said that excessive charges prevented the development of aviation but admitted that lower charges required more aircraft. A refusal to enlarge aerodromes would force the use of aircraft which landed slowly with the aid of devices which he could recommend. This course was preferable to the use of helicopters which, like the Government, went round and round, getting nowhere. He praised the municipalities and the late Sir Sefton Brancker for their work in setting up aerodromes.

Then MR. NEWTON recalled that Sir Frederick, then Mr. Handley Page, had spoken at their first dinner, in 1939, and that their first chairman, Dick Ashley Hall, and their first secretary, Harold Gillman, were also present at this 1958 function. He hoped the Government would extend help to cities and towns who had already invested in airports on their own account. Helicopters should operate between city centres, he said, not between airports, as the B.E.A. Helicopter Unit proposed doing.

ALDERMAN RHODES W. MARSHALL, of Blackpool, spoke of the difficulties in dealing with Government departments and warned that there was a limit to the financial calls which ratepayers would stand.

SIR GERARD D'ERLANGER, B.O.A.C. chairman, wryly observed that aerodrome owners seemed to him to be like tycoons of the past, men of vision—and wealth. His corporation had to pay £3 million annually when the international aerodrome owners passed the plate round. London Airport's operating facilities were the World's best but, in general, aerodrome facilities were not keeping pace with aircraft development. The World's hotel shortage was chronic and travellers finding no place to go would not come again.—WREN.

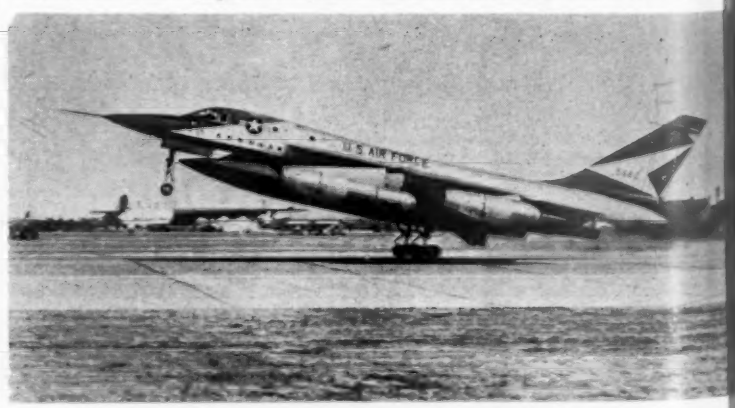
Supersonic Weapons System



The Convair B-58 Hustler has been subjected to an extensive test programme called "Operation Whirlwind," and recently flew for more than 90 min. at supersonic speed. Right, the automatic rotating six-barrel gun mounted in its tail.

Above, the conical-camber leading edge of the wing is apparent. The head-on view (right) emphasizes the highly unorthodox form of the Hustler and shows the positioning of the four 11,000-lb. thrust G.E. J79 turbojets.

Howard Levy photographs



The nose-gear of the B-58, with the weapons pod immediately behind it, is seen on the left. A characteristic attitude is shown in the picture above. The Hustler is in initial production for the U.S.A.F. at Forth Worth, Texas. That illustrated is the fifth one.

Howard Levy photographs

PRIVATE FLYING

H.J.C.'s Club Commentary:

Flying in the Union

Summer Plans U.S. Business Flying

● ONE OF the largest flying clubs in South Africa, writes Capt. D. A. Vetch, is the **South African Air Force Aero Club.** Based at Air Force Station Swartkop, just outside Pretoria, the club has 17 aircraft, five gliders and 57 members. A branch also operates at Air Force Station Langebaan in the Cape.

Although operations first began in the early '30s, it was not until 1947, when the club was re-formed, that it took on something of its present form. In forming the S.A.A.F. Aero Club it was the intention to provide flying for any member of the Permanent Force at the cheapest practicable rate. This aim has been maintained throughout, and although flying fees have inevitably risen because of increased running costs, it is still possible to fly for as little as 36s. an hour. This fee is further reduced by the South African Government subsidy scheme, whereby a pupil, on obtaining a P.P.L., receives a grant of £60. It is therefore possible to obtain a licence for less than £50, and has made flying a reality for both officers and other ranks of the three Services who otherwise would probably never have got off the ground.

● IT HAS BEEN possible to keep costs down because all aircraft repairs and servicing are done by enthusiastic members, who, under the guidance of Sgts. Moolman and Naude, are kept hard at it. But it is thanks to the untiring efforts of the club's treasurer and founder member, Capt. "Blackie" Swardt, that the books are kept out of the red.

The chairman and C.F.I. of the club is Maj. D. Pidsley, D.F.C. Instructors include Capt. "Tommy" Vanston, Capt. "Ginger" Keightly, Lt. Ed Pienaar and Lt. Van der Westhuizen, who are also Service instructors and give up their Wednesday and Saturday afternoons for the benefit of members.

For training there are two Piper Cubs and two Tiger Moths, and a recent addition is a Piper Tri-Pacer, which is used solely for touring. It has a full panel and is in constant demand, members taking their families and friends to such places as Port Elizabeth, Durban and Lourenço Marques for leave or weekends.

Gliding has a large following and is under the control of Sgt. Swart. A Tiger Moth is normally available for towing, although the gliding section has been grounded for some time recently because of a shortage of Tigers; but with the advent of summer and a Tiger having become airworthy, thermal-hunting over the Transvaal has begun again.

The club flies under both Service and civil regulations, and it is probably because of this that apart from three forced landings, in which virtually no damage was done, the club has an accident-free record. A considerable interest is taken in the club activities by senior officers of the S.A.A.F., and it has now been declared an official sport.

COMMERCE AT ELSTREE.—Students enrolled by the Elstree Flying Club for the first C.P.L. course are from the Continent besides this country. A second course is to begin on May 6. In the front row can be seen some of the instructional staff, including the C.I., David Ogilvy, under propeller, William Bailey, the C.F.I., on his right, and John Schooling on his left.

Ex-Fighter Executive

THE North American F-51D-25NA Mustang shown in the picture below has been converted into a two-seater and is flown by Mr. D. B. Lindsey, Jr., owner of a Sarasota, Fla., newspaper, as an executive aircraft. It is powered by a Packard Merlin engine and cruises at 350 m.p.h. at 20,000 ft. Equipment includes standby gyros, ADF, ARN-6 radar, Omni, three ARC transmitters, dual oxygen, and Safeflight speed controls. The wing gun mounts have been removed, providing spacious baggage compartments.

Levy-Shipp photograph.

● A CHIPMUNK is being supplied to the **Kuala Lumpur Flying Club** for training and is now en route for Singapore. It will become the first civil-registered Chipmunk in the Federation of Malaya.

More news from Malaya is that Mr. Aw It Haw, 28, landed at Paya Lebar airport recently in an Auster Aiglet which he had bought and flown out from Britain, becoming the first Malayan to make the solo flight. He stated that his only mishap on the 8,000-mile flight was an emergency landing near Paris when the airscrew broke. He learnt to fly in the U.S.A.

● JUNE 14 is the date provisionally given by the **Elstree Flying Club** for its annual "At Home" party. The same date has been fixed by the **Plymouth Aero Club** for an air display at Roborough. At the latter there will be R.A.F. and R.N. participation. Sir John Walsham, Bt., Captain of the R.N. Engineering College at Manadon, has given permission for the College to provide a static show.

GLIDING NOTES

ACCORDING to Lasham's *Newsletter*, published on January 25, the earliest thermal cross-country of this year was done in the Eagle (T-41), but no details are given. However, Lasham's particular business just now, Brenda Horsfield writes, is "gradually working through the list of people needing five hours' duration by packing them off to hill sites whenever the weather looks hopeful."

The need to include a 5-hr. flight in the tests for the Silver "C" certificate is being doubted by more and more people nowadays, and a correspondent of *Sailplane and Gliding* has complained that the increasing number of people doing it is cluttering up the air space at the few hill sites available. But it can only be abolished by international agreement.

Lasham normally uses the South Downs at Cocking, but one of its clubs, the Army Gliding Club, has kept a Skylark 2 at the Long Mynd throughout the winter. On one February day Daphne Poynton and Geoffrey Barrell just fitted in 5 hr. each in the available daylight, and on February 23 Lionel Pike was just finishing his 5 hr. there when wave lift at 10 ft./sec. appeared, but dusk was approaching and several Midland Club machines had to break off their climbs at 4,000 ft.

On February 17, the day after the Yorkshire and Cambridge cross-countries, Brian Masters was towed to Cocking for five hours' slope-soaring but was able to spend half the time in thermals.

* * *

GUEST OF HONOUR at the London Gliding Club's annual dinner on February 22 was Maurice Imray, who, besides running the Popular Flying Association and managing the Air Touring Department of the R.Ae.C., is that club's representative on the Council of the B.G.A., and in that capacity has been largely responsible for getting the boundary of London Control Zone shifted to the south of the London Gliding Club's site. Replying to the toast of "The Guests," he urged that though private fliers may be in a minority nowadays, "don't let us be an oppressed minority."

Godfrey Lee, the chairman, presented the annual trophies: the Dent Cup to Mike Garrod, of Dunstable Met. Station, for his 193-mile goal flight to Plymouth in a Skylark 2 on June 23; the Desoutter Trophy to Geoffrey Butt and Leslie Moulster for reconstructing a Kite I; and the Derry Trophy to C. A. ("Chuck") and Mrs. Bentson, from the U.S., for countless hours of volunteer work in renovating the clubhouse.

* * *

AN item in *The Times* of February 14 refers to a message from Wellington, New Zealand, which states: "The record height for a solo powered-aircraft flight has been exceeded by Mr. F. H. Georgeson, who reached 29,400 ft. The flight was made from Christchurch airport over the foothills of the Southern Alps but will not be counted as a record as it does not beat the existing record by 5 per cent."

The "F" is an obvious misprint, for the pilot can have been none other than S. H. Georgeson, who has soared many times in the wave to leeward of the Southern Alps and at various times taken a sailplane to heights of between 22,000 and 26,000 ft. No doubt he flew his usual tug, a Tiger Moth, and used his special knowledge to coax it heavenward in wave lift, which is commonly of the order of 15 ft. per sec. in those parts.

* * *

AT the Yorkshire Gliding Club on Sunday, February 16, a comparative newcomer to gliding beat the Midland Club in altitude and the Cambridge Club in distance, all in one flight. He was Ron Hellewell, who had made his first solo only last May. He took off from Sutton Bank in the club's Kite 2, and climbed in hill lift and thermals up to the base of a cloud at 3,500 ft. a.s.l. It looked like cumulus but behaved like a wave cloud, because he found lift upwind of it; then, to his surprise, the lift continued up to 11,000 ft., so he outclimbed the Midland Club pilots who reached 10,400 ft. and 9,000 ft. in waves on the same day.

From this height, Hellewell glided 30 miles down-wind to a point near Selby, then picked up thermals and continued to Cottingham, near Hull, 46 miles from Sutton Bank; this beat a Cambridge pilot's 20 miles. Chris Riddell writes that "the waves did not appear to lie across wind but were more oblique" and he refers to "rotor clouds" resembling cumulus.

* * *

A NEW CLUB for the Plymouth area, called the South Western Gliding Club, has had the idea of making all its launches by aero-tow, because there is some reason to think that the flying time occupied by a pupil in learning would cost no more that way than with launching by winch. Ann Welch has gone into the economics and it seems that a flight from an aero-towed launch would cost roughly 1s. a minute, which is just about the rate for a 4-min. descent from a 4s. winch launch.

To find out if aero-towing is feasible from Roborough Airport, which the new club expects to use, Malcolm Laurie and John Neilan, with their wives, took their T-42b "Beagle" there from Lasham for the week-end February 22-23, and a Tiger Moth was brought over from the Cornish Gliding Club at Perranporth by George Collins and Ted Berry.

There was a 15-knot wind from W.N.W. but, unfortunately, Neilan writes, the ground slopes up in this direction and the Tiger Moth was unable to accelerate to climbing speed with the Beagle in tow, so had to release the cable; the sailplane had enough aerodrome in front of it for a straight descent and an uphill landing. A cross-wind take-off was likewise impracticable, as it would have had to be made through a narrow gap. This was, of course, a disappointment for the new club; it is also disappointing that a chance has had to be missed of showing if a club can run as cheaply with aero-towed launches alone as it can with winches or auto-tows.

—A. E. SLATER.

CORRESPONDENCE

Where the Light Aircraft of Yesteryear Are

WE READ with great interest Mr. L. G. Cooper's letter in the issue of THE AEROPLANE for February 7, and would like to comment on several points in it.

To answer the question in the heading of the letter, we can tell you exactly where the light aircraft of yesteryear are; those which have survived the ravages of time are being flown most actively, in default of anything better, by clubs and groups and private individuals.

Speaking for ourselves we exhibit more than a tendency to enthuse over the capabilities of ultra-light aircraft. We are convinced of their utility, know their capabilities and believe that they represent the only feasible solution to the problem of replacing old light aircraft which is within the grasp of the average group or individual.

It is not possible to say from his letter just which aeroplane Mr. Cooper has in mind which is ugly, expensive and no better than a Chipmunk. There are three ultra-light aircraft which are intended for production: the Turbulent (about £1,000), the Phoenix Aircraft Luton Major (under £1,000) and the Emeraude (about £1,900). Now—the Chipmunk is no longer in production, costs considerably more and requires considerable expensive modification before it is considered fit for embattled minorities to fly in civil guise. Moreover, the Chipmunk is primarily a training aeroplane while these new ultra-lights cater for the touring and general needs of the ever-growing but frustrated band of trained pilots, the "man with a P.P.L."

It seems to us that the essential facts to recognize in the present situation are these: all the ultra-light aircraft offered here or in France are proved, available, easy for amateurs to construct (which lowers the average price to about £600) and cheap; £1,200 for a new aeroplane *is* cheap when a reconditioned Tiger Moth costs £750—and that is about as cheap as second-hand, properly reconditioned, aeroplanes come.

Until the aviation industry can be weaned from the present "cost-plus" system of contract building, there is no alternative to the Popular Flying Association's effort to provide cheap, adequate flying for private owners and groups. Nothing would please us better than to see the authorities stung, goaded or shamed into doing their duty by the section of the populace for whom M.T.C.A. are supposed to cater and to see restrictive legislation lifted and preventive thinking outlawed so that some firm could tackle this problem. Meanwhile, we shall continue to take the practical steps which we have been taking for some time.

On the score of ugliness, we will swap quotations with Mr. Cooper: "Beauty is in the eye of the beholder."

London, W.1. J. H. BLAKE,
P.R.O., Popular Flying Association.

Bombing Crews and Bombing Errors

From Sir Robert Saundby.

I AM graeful to Mr. J. R. Anderson for pointing out, in his letter under the above heading (February 28), a mistake in my article "Photography's Indispensable Part."

The Air Ministry agreed to the equipment of the Command

with cameras and flashbombs early in 1941, not 1942. The date, as near as I can fix it, was February, 1941.

From that time onwards the policy of Bomber Command Headquarters was to encourage the bomber crews, as Mr. Anderson says, to study the results of their bombing, and to that end all available aids were provided.

Burghclere, nr. Newbury. R. SAUNDBY.

Airport Speed Limits

A RECENT High Court case, so far as my newspaper reported it, left open the question as to whether the roadways within the boundaries of London Airport are private or are public thoroughfares.

Since a number of unlicensed vehicles seem to use them, I have always thought that they were non-public. However, not long ago, I was (most uncivilly) challenged by a policeman for exceeding an alleged speed limit. That is relatively unimportant: what might be of extreme importance is the relevance of the point in connection with insurance policies, liabilities, etc.

Can anyone enlighten me?

London, W.1. W. E. P. JOHNSON, A.F.C., C.P.A., A.F.R.Ae.S.

[On this subject we put to the M.T.C.A. the following questions:—

"1. Is it true that unlicensed vehicles do use the roadways within the boundaries of London Airport?

"2. Are there speed limits?

"3. If the answer to No. 2 is in the affirmative, on whose authority are such limits decided?"

The replies given by the Ministry were:—

"1. Yes. The Vehicles Excise Act (1949) requires privately owned vehicles to be licensed if used on a public road, i.e., a road repairable at the public expense. The Minister is advised that roads on M.T.C.A. airports do not fall within this category. No licence therefore is required for vehicles used solely on such roads. Vehicles owned and used by the Ministry do not require a licence even when used on a public road.

"2. Yes.

"3. The roads on the airport are deemed to be roads in a built-up area by virtue of Section 1 of the Road Traffic Act, 1934."—ED.]

Reviving an Industry

WITH reference to Mr. F. Dunkerley's letter in THE AEROPLANE of February 21, in which he in turn refers to Mr. Edgar Percival's article on "How to produce more light planes." Both these gentlemen appear to have forgotten that we have in England at the moment under production a four-seater cabin aircraft well below the price of any similar aircraft in the World.

I refer, of course, to the Jackaroo produced by my company and selling at £1,095.

As you will know, the full normal category C. of A. has now been issued for this aircraft—in fact three have been in use by the Wiltshire School of Flying, Ltd., for instructional purposes for the past six months.

I am therefore somewhat surprised to see in the account of the recent A.B.A.C. dinner Sir Alfred le Maitre in his speech, to use your report's words, "took up the cry for the sporting pilots for the production in Britain for a new 100-h.p., 100-m.p.h. light aeroplane selling at not more than £2,000"

This is exactly what the Jackaroo is! You will remember that in the 1957 King's Cup Air Race there were two Jackaroos entered, one of which averaged over 104 m.p.h., and moreover the price of this aircraft is £1,095—not £2,000.

It may interest your readers to know that we have an order for 60 of these aircraft for one foreign country alone, and as soon as we have caught up with our present orders for Jackaroo, we intend to produce a high-wing four-seater cabin monoplane to sell at £2,000.

Thruxton, Andover. J. E. DORAN-WEBB, SQN. LDR. Jackaroo Aircraft, Ltd.

Honours Overdue

IT has been made clear by Sir Robert Saundby's review of "Evidence in Camera" (THE AEROPLANE, February 14) that Sidney Cotton's determination to establish a new kind of aerial photographic intelligence unit for the R.A.F. made a major contribution to victory—in spite of official obstruction and disbelief. So why has no official recognition been made by bestowing a title or decoration—other than an O.B.E.? Honours offered by the French to members of the Sidcot Unit on May 8, 1940, were refused by the Air Ministry; and after the War the French wished to confer the Legion of Honour and the Croix de Guerre on Cotton, who was shown the official letter in Paris. But he was not given permission to receive them.

In the Kaiser's War, Cotton invented the Sidcot Suit, but his high-minded principles forbade his making money from it in wartime, though others did! For the same reason he neither sought nor received reward for his inventions in Hitler's War such as tear-drop cockpit covers, leading-edge fuel tanks to give Spitfires longer range, Turbinlite, Lee Light, and many more.

Now that the full story of his part in the establishment of photographic intelligence and interpretation has at last been made public, he should be awarded honours long overdue.

London, S.W.5. GEOFFREY DORMAN.

Roundabout

Accountant Rendered. While I don't believe that the backers of the Aviation Trader's *Accountant* will let their Dart-powered transport die without a struggle, the report of its difficulties does remind me of the remark made when the company first announced its intention to break into the dicey business of aircraft manufacturing. Said the cynics, "If the first model is called the *Accountant*, the second will be the *Auditor*, the third the *Receiver*."

*

True Story. An airliner took off from Switzerland for London and quickly ran into shocking turbulence and storm. The cabin staff lurched about, administering sedatives, cold compresses, brown-paper bags. A shambles. But all things come to an end and they eventually landed at London. As they taxied in, the stewardess, loyal to her calling, picked up her microphone and said:—

*

Let's Face It Dept. P.R.O.s must get a wry sigh out of some aspects of their job, an observation evoked by a package sent to me from America. On the necessary attached Customs label, my P.R.O. friend has stated as follows: *Contents*—Letter, brochure, photos. *Value*—None.

*

Rain from Plane cuts Plain in Twain. So this aerial rainmaking really works. You just have to keep an eye on possibilities. An aircraft of Australia's Commonwealth Scientific and Industrial Research Organization "seeded" some promising clouds at Mt. Isa, Queensland, and caused a terrific downpour. A few hours later the flooded Leichardt river cut off the rainmakers returning from the airport.

*

"The Whistle-Stop job—an idea Sir George brought back from America—quick turn-round—passenger appeal. . . ."

by Crosbie

NOTES AND EVENTS

ON SHOW.—This 12-ft.-span D.H. Comet 4, made by Minavia Models, Ltd., of Balham, will be a feature of the B.O.A.C. stand at the forthcoming Brussels Exhibition.

EQUIPMENT COOLING.—A new fan unit known as the "Wafter" has been manufactured by Plannair, Ltd., for cooling small items of electronic and other equipment, and the localized hot spots that occur in larger units. Operating on 115-230-V., single-phase 50-cycles supply, the 3¼-in. by 3¼-in. fan unit weighs 16½ oz. and moves approximately 40 c.f.m. of air under free intake and discharge conditions.

DECCA MOVE.—The head offices of Decca Radar, Ltd., and the Decca Navigator Co., Ltd., have moved to a new building, Decca House, 9 Albert Embankment, London, S.E.11. The telephone number is unchanged at Reliance 8111.

PSYWAR

ENTHUSIASTIC collectors of propaganda leaflets dropped from aircraft during the two World Wars, in Korea, Indo-China, Malaya, Cyprus and elsewhere, have formed an international organization, known as the Psywar Society — the name implies "psychological warfare."

The Society's honorary general secretary is Capt. P. H. Robbs, 8 Ridgway Road, Barton Seagrave, Kettering, Northants, who has a collection of about 5,000 such leaflets. He would be pleased to hear from readers interested in joining the Society or those who have unusual items worth recording in the Society's bulletin.

NEW PREMISES.—James Burness (Travel), Ltd., has now moved from Stone House, Bishopsgate, London, E.C.2, to 14 Bury Street, London, E.C.3; telephone, Avenue 3781-3.

CHANGE OF ADDRESS.—The Manchester branch sales office of the British Aluminium Co., Ltd., will be transferred from 46 Fountain Street, to Woolwich House, 59-61 Mosley Street, Manchester 2, on March 25. The telephone number will in future be Central 2331.

"THE AEROPLANE" INDEX.—The index to THE AEROPLANE, Volume 93 (July-December, 1957) is now available. Applications for copies, with 4d. in stamps to cover packing and postage, should be sent to Temple Press Limited, Bowling Green Lane, London, E.C.1.

HISTORY LESSON.—King's College Department of Extra-Mural Studies, University of Durham, has organized a week-end school from March 22-23, under the title "Flight," Mr. J. E. Allen, B.Sc.(Eng.), A.M.I.Mech.E., A.F.R.Ae.S., F.B.I.S., head of the aerodynamics, projects and assessment department of Avro's Weapons Research Division, will conduct four lectures tracing in non-technical language the evolution of aeronautics. Further information about the week-end school is available from the Director of Extra-Mural Studies, Joseph Cowen House, 153 Barras Bridge, Newcastle upon Tyne, 1.

TEXAS EXHIBITS.—At the Physical Society's Exhibition to be held in the Royal Horticultural Society's Old and New Halls, Westminster, London, S.W.1, from March 24-27, Texas Instruments, Ltd., of Bedford, will show a wide range of silicon diodes and transistors. Demonstrations illustrating typical applications will also be given.

Aviation Calendar

March 11.—Inst. of Civil Engineers lecture, "Akrotiri Airfield, Cyprus," by J. Ellis, at Gt. George St., **London,** S.W.1, at 17.30 hrs.

March 11.—R.Ae.S. Boscombe Down Branch lecture, "Navigation and the Air Traffic Control Problem," by D. O. Fraser, F.I.N., A.R.Ae.S., in the lecture hall, A. and A.E.E., **Boscombe Down,** Hants, at 17.45 hrs.

March 12.—R.Ae.S. Weybridge Branch lecture (joint meeting with the Inst. Mech. Engineers, Southern Branch), "Aircraft Production — Present and Future," by S. P. Woodley, M.B.E. (general manager, Supermarine), at the Apprentice Training School, Vickers-Armstrongs (Aircraft), Ltd., **Weybridge,** at 18.00 hrs.

March 12.—R.Ae.S. Southampton Branch lecture, "Future Developments with Satellite Rockets," by Dr. L. R. Shepherd, B.Sc., A.M.Inst.P., in the Inst. of Education, **University of Southampton,** at 19.00 hrs.

March 13.—R.Ae.S. main lecture, at Christchurch Branch. "Flight Tests of a Meteor Aeroplane fitted with Jet Deflection," by P. F. Ashwood, A.F.R.Ae.S., and D. Lean, A.F.R.Ae.S., at **Bournemouth** Technical College at 19.30 hrs.

March 14.—British Gliding Association annual ball at Londonderry House, 19 Park Lane, **London,** W.1, 20.30 hrs.-02.00 hrs.

March 17.—R.Ae.S. Bristol Branch, Barnwell Memorial Lecture, "The Economy of Structures," by Sir Alfred Pugsley, in the conference room, Bristol Aircraft, Ltd., Filton House, **Bristol,** at 19.00 hrs.

March 19.—R.Ae.S. Leicester Branch lecture, "Aircraft Photography, 1913-57," by John Yoxall, in the lecture theatre, **Loughborough College,** at 18.45 hrs.

March 20.—R.Ae.S. section lecture, "Problems in the Development of a Guided Missile," by J. Clemow, M.A., at the Royal Institution, 21 Albemarle St., **London,** W.1, at 18.00 hrs.

March 21.—Inst. of Navigation lecture, "The Effective Utilization of Air Space," by E. J. Dickie, M.B.E., at the R.G.S., 1 Kensington Gore, **London,** S.W.7, at 17.15 hrs.

March 25.—R.Ae.S. Luton Branch A.G.M. and Presidential Address, in the Napier senior staff canteen, **Luton Airport,** at 18.15 hrs.

March 26.—R.Ae.S. Preston Branch lecture, "American Production Methods," by A. W. Turner (D.H., Broughton), in the Queen's Hotel, **Lytham,** Lancs, at 19.30 hrs.

March 27.—13th British Commonwealth lecture, "Why Airlines are Hard to Please," by B. S. Shenstone, F.R.Ae.S., at the Inst. of Civil Engineers, Gt. George St., **London,** S.W.1, at 18.00 hrs.

March 27.—R.Ae.S. Bristol Branch A.G.M. and film show, in the conference room, Bristol Aircraft, Ltd., Filton House, **Bristol,** at 18.00 hrs.

CANADIAN PUBLICITY.—A new publication, *The Hunting Newsletter*, is to take over the job formerly done by *PSC Air Survey News*, and covers the activities and background of various Hunting companies in Canada. This announcement is made by Mr. Douglas N. Kendall in the first issue, dated January, 1958.

Company Notices

NEW COMPANIES

Derby Aerosurveys, Ltd. (598,985).—Private co. Reg. Feb. 17. Cap. £5,000 in £1 shs. Objects: To carry on all or any of the businesses connected with survey and photography from the air or on the land, etc. Directors: Clifford A. Bowman Wilcock, 78 Buckingham Gate, London, S.W.1, director of Bowman and Sons, Ltd., Derby Aviation, Ltd., etc.; Edward W. Phillips, 44 Vicarage Gardens, Derby (both permanent); David F. Ogilvy, Chalkfield Cottage, 42 Watford Rd., St. Albans; Herbert C. Butcher, Elstree Aerodrome, Elstree, Herts, director of Photoflight, Ltd. Sec.: Mildred M. Ager.

Severn Aircraft, Ltd. (598,740).—Private co. Reg. Feb. 11. Cap. £6,000 in 1,000 ordinary and 5,000 redeemable preference shs. of £1 each. Objects: To carry on the design, construction, operation and maintenance of aircraft of all kinds, etc. Directors: Roy W. Brown, Canal Cottage, Aberdare, Glam.; Denys S. Martin, 63 Cathedral Rd., Cardiff, directors of Engineering Arts, Ltd. Sec.: P. R. Brown. Solr.: Wm. Spring, 10 Bell Yard, London, W.C.2.

New Patents

APPLICATIONS ACCEPTED

793,510.—Blackburn and General Aircraft, Ltd.—"Doors or closure members for bomb bays or like spaces in the fuselage or wings of aircraft."—March 15, 1955 (Dec. 13, 1954).

793,443.—Cobactor (Kingsway), Ltd.—"Structural members."—July 27, 1955 (July 28, 1954).

793,538.—Fairey Aviation Co., Ltd.—"Helicopter rotors."—March 16, 1956 (March 18, 1955).

793,329.—Soc. d'Inventions Aéronautiques et Mecaniques, S.I.A.M.—"Aircraft landing gear."—Jan. 23, 1956 (Jan. 22, 1955).

Applications open to public inspection on April 16, 1958; opposition period expires on July 16, 1958.

Personal Notices

BIRTHS

D'Arcy.—On February 11, at Aldershot, to Isabelle, wife of Flt. Lt. S. H. R. L. D'Arcy—a son.

Denney.—On February 12, at Reading, to Nanette (*née* Easterbrook), wife of Sqn. Ldr. A. Denney—a daughter.

Hill.—On February 22, at Redhill, to Helen, wife of Norman Hill—a daughter.

Maish.—On February 15, at Jever, Germany, to Shirley, wife of Flg. Off. W. B. Maish—a son.

Pawson.—On January 30, at Fontainebleau, to Jennifer (*née* Lewis), wife of Wg. Cdr. G. I. Pawson—a daughter.

MARRIAGE

Hetherington—O'Brien.—On February 10, at Foxrock, Eire, Flt. Lt. Peter W. Hetherington to Mairead O'Brien.

DEATH

Stanning.—On February 20, as a result of a flying accident at Bruggen, Germany, Flt. Lt. Peter Hallam Stanning.